BLUE BOOK



WAR LOAN

THE A. F. HOLDEN COMPANY





Hobart's Multi-Range Dual Control gives you 1.000 combinations of voltage and current assuring best results under all conditions.

3. Convenient Starting—Stopping

Start, stop and reset buttons operate switch located inside turret top-protected against overload, under voltage and conditions of phase unbalanced in power supply.

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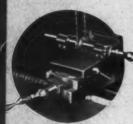
ADDRESS

One of the World's Largest Builders of Arc Welder

Spherical Turning



Automatic Turning



Universal Grinding

SPECIFICATIONS

| lwing over bed, diq |
|--|
| Distance between centers |
| Collet capacity, max. dia. |
| top chuck capacity, man dia 6 |
| ow chuck capacity, max. dia. 6 |
| pindle copacity, max. dia 1 1/6" |
| lide rest, travel of tool post slide 51/4" |
| lide rest, trovel of cross slide 5 % |
| cilstock spindle travel |
| pindle speeds, eight forward and re |
| verse. |
| |

Veight of lathe, mounting and drive, not 850 lbs.

RIVETT LATHE & GRINDER, Inc.

918 PLAIN CABINET LATHE

Tool-room - Assembly - Production

The Rivett No. 918 plain cabinet lathe is a versatile machine capable of many operations. In addition to the normal lathe functions of turning, facing, boring and drilling, the 918 can be equipped for milling, grinding, slotting and thread chasing.

The operating conveniences and design features assure efficiency on any operation. Work can be quickly gripped in collet or step chuck or mounted on centers or face plate. Selected spindle speeds are controlled by single lever. Built-in accuracy, correct spindle speed and dynamic balance guarantee finish to closest tolerance.

The machining capacity and producing efficiency of the 918 plain cabinet lathe open many opportunities for its use in the tool-room, assembly and production departments.

Write for bulletin.





A request on your company letterhead will bring you a copy of



this 16 page bulletin summarizing the profit making possibilities of each Hardinge precision product.

PERFORMANCE

has established leadership for



ARMSTRONG



ARMSTRONG HIGH SPEED

ARMALOY

ARMIDE

Correct ARMSTRONG TOOL HOLDERS and correct Cutter Bits for every machining speed and every machinable material



The Armstrong System of Tool Holders provides correctly designed ARMSTRONG TOOL HOLDERS for every operation of lathes, planers, slotters and shapers and for many turret lathes and serve machine operations. It also provides proper types of cutters, bits and blades for every cutting-speed and material.



ARMSTRONG TOOL HOLDERS for HIGH SPEED CUTTERS

- For general tool room and machine shop use ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".
- ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-fitted castings, malleable iron, non-ferrous metals, rubber places are madern machined and feed can be obtained to take advantage of their greater cutting cassetty.
- ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Helders, make the use of Carbide-tipped teels practical in even the smallest shop. Coming in twe grades ARMIDE Red (for steel) and ARMIDE Gray (for east iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-gradelings as much as 10 to 30 times.



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100c HOLDER Are Good in Daw 745 of the Maddine Shope and Soul Rosses

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago S

Published Monthly

Volume 41, No. 6

JUNE 1945

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CHECK Runout to .0001"



YOU'LL check work between centers easier, faster and within limits of 0.0001" on this improved Sundstrand Bench Center.

- "One-hand control" over all movable elements leaves the operator's second hand free to control the part being checked. Both headstock and tailstock can be unclamped, positioned and locked in place with a single hand operating the top lever on each.
- The tailstock center is quickly clamped or unclamped by means of the front lever, while the end bar retracts the spring-loaded

center. In addition, the indicator support can be manipulated with one hand while moving it away from the work for loading and unloading, and against the work for checking the runout.

 Center holes of headstock and tailstock are bored together for precision. The heavy ribbed base prevents deflection under clamping and assures a longer lifetime of accurate work. Easy to clean, compact, portable . . . can be placed on bench or on a stand convenient to the work.

Available in 6 sizes from 6" x 18" to 12" x 72" Write for complete specifications and prices today.





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THE EASIEST-TO-USE DIE HEAD

... and the Fastest

Here is an improved NAMCO nonrotating DIE HEAD that "streamlines" the whole thread-cutting operation—brings new ease of operation and convenience—shortens idle time—gets more work done.

Open or Close from any Position

Close die by a quarter-turn from open position, in either direction. Handle is always in easy reach no matter where die head is positioned on machine.

Replace Chasers in Seconds

Merely lift the handle and chasers, mounted on blocks, slide out of grooves. From dull to sharp chasers is a matter of a few seconds—no screws to loosen or tighten—no change of precision.

The Circular Chaser Principle

Nameo Circular Chasers have proved their alkility to produce more precision work. They eliminate trial cuts—the first piece is production—uniform precision insured throughout long runs.

Here is your complete data

The new Namco Die and Tap Catalog, D-42-B, gives you all details of Namco tools for high-speed precision work. Send for your copy.



Open and close with 90° turn of handle, in either direction.

Lift handle to remove chasers . . . no screws to turn, no adjustment to make.



The NATIONAL ACME CO.

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Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics - Single Spindle Automatics - Automatic Threading Das and Tags - The Ching - Limit, Meter Starter and Control Station Switches - Solennids Centrifuges - Contract Manufacturing



At one setting a CINCINNATI Plain Hydraulic grinds an unusually smooth and accurate finish on the diameter and flange of an aircraft cylinder barrel.

On this particular job there were three requirements: (1) exceptionally high-grade finish on diameter and adjacent flange; (2) fast production; (3) accuracy. This CINCINNATI 10" Plain Hydraulic Grinding Machine, tailored to the job, filled the bill completely. Here are the changes that were made in the

machine: Wheelhead set at a 30° angle, with headstock and tailstock interchanged so that the heavier unit could absorb the thrust. In addition, the machine is equipped with a standard automatic infeed attachment which leaves the operator free to attend to other duties while the grinding operation progresses.

CINCINNATI Application Engineers will be glad to discuss with you the adaptation of standard machines, slightly modified, to your precision grinding work.

THE CINCINNATI MILLING MACHINE CO

PRODUCES FINER FINISH

ON DIAMETER

AND FLANGE

Below: CINCINNATI 10" Plain Hydraulic Grinding Machine with angular wheelhead. Notice that the headstock and footstock have been interchanged to direct the thrust against the headstock unit.



Above: With wheel at an engle the same high-grade finish is preduced on both diameter and flangil at one setting.



CINCINNATI GRINDERS INCORPORATED SHISHMAN

MACHINES CENTERTIPE GRINDING MACHINES CENTERLESS GRINDING MACHINES CENTERLESS LARRING MACHINES

MACHINES PUNCH THE CLOCK, TOO!

No. 1/2

ON THE JOB

ABRASIVE No. 1½ Surface Grinding Machine turns out a good day's work away day . . . year after year. In heavy one-piece bed casting, on ABRASIVE feature, is assurance of long dependable service. Motor mounted directly on the spiralle means fewer moving point . . no belts or sprockets . . less viteration and maximum power at the cutting point. Hand feed design speeds tooltoom grinding jobs, convenient controls and large handwheels permit maximum output on the production line. Recommended for the most precise type of flat, from and gage grinding. Unusual capacity up to 15" long x 10" WIDE x 18" high.

BULLETIN ON REQUEST

ABRASIVE WILLIAM

ABRASIVE MÁCHINE TOOL CO. . EAST PROVIDENCE 14, R. I.

Simple hand operated controls state the No. 1½ on Ideal, safe machine for unstilled



Sub-zero Treating Increased Production from 2,000 to 12,000 Tapped Holes per Sharpening and Greatly Reduced Machine Down-Time

Here is an example of how Cold Treating increased the productivity and efficiency of one type of metal cutting tool. This large Midwestern manufacturer taps 6 holes in cast-iron automotive brake cylinder blocks with a ½ "tap.

Prior to Cold Treating, production averaged was 2,000 holes per tap sharpening. This required changing taps after the com-pletion of approximately 300 blocks, resulting in excessive machine down-time. Some method had to be found to increase tan life and lessen it.

Cold Treating in a Deepfresse Industrial Chilling Machine solved the problem. By subjecting these taps to sub-zero respersaures of -120°F, a plife was increased from 2,000 to 12,000 holes per tap sharpening—a total productive increase of over 500°F. This increase greatly minimized machine down-

time. Instead of changing taps every 300 blocks, now from 1,500 to 1,800 blocks are tapped before a change is required.

How Cold Treating Increases Performance Life of Tools

Rapid wear of the conventionally heat-treated taps indicated sub-zero treatment as a possible remedy. Sub-zero treatment as -120° F. gave a structure possessing an improved combina-tion of hardness and toughness, resulting in increased cutting efficiency and lengthened tool life.

Cold Treating Has Numerous Applications

Cold Treating is not restricted to cutting tools. It is also applied with outstanding results to other types of tools and parts where increased hardness and uniformity of structure are demanded for maximum efficiency. It provides the only practical solution of stabilizing gauges and precision parts where a high degree of quabilization is required. It reduces coats and increases production on shrink-de assembly. It is believed to the provides of the provides



JOB FACTS

Part-Cast-iron Brake Cylinder. Operation-Tap 6 holes. Tap-5/6" Wood and Spencer. Tap Life Before Cold Treating. 2,000 holes per sharpening. After Cold Treating, 12,000 to 15,000 per sharpening.

FREE ... Here's Cold Treating

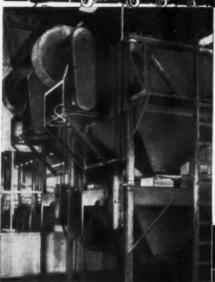
To understand the principles of cold treating and how it can be applied so your production, get this valuable book. It gives you concise, factual dat

tested procedures, field test reports and specifications of Deepfreeze Industrial Chilling Machines. Write today for your free copy of Bulletin No. I-4.



WE COLLECT THE CHIPS

for more propellers



Above—Two 6A Special Airmat Dustboxes collect. 12 cubic feet of Aluminum Alloy chips an hour from propeller blade profilers.

Here is an interesting application of AAF equipment to materials collection which does not directly involve a dust hazard. Airmat Dust Arresters segregate two different types of aluminum allov chips for salvage in the propeller division of a large aircraft manufacturer. Since blades made of both allovs are worked on the same machines it was necessary to install parallel collecting systems, either one or both of which may be operated as reauired.

Below—Aluminum Alloy Chip Conveying Systems for 10 Propeller Profilers. Parallel exhaust systems to separate Airmat Dustboxes permit segregation of two alloys.





If you have a materials collection problem or a dust problem, AAF can help. Send for new edition of "AAF in Industry." No obligation!

AMERICAN AIR FILTER COMPANY INC.

312 Central Avenue Louisville 8 Ky -In Canada Darling Bros Ltd. Montreal P Q





This book "Beyond a Shadew of a Doubt" will tell you more about our Optical Comparators and what they are daing. The tolerance on the profile of this form ground die section is plus or minus .0005". Inspection is simple—the profile is projected at 62½ magnifications upon the 30 inch screen of the Jones & Lamson Optical Comparator and compared with the accurately scribed master outline.

The Jones & Lamson Pedestal Optical Comparator is an essential to the modern tool room. When equipped with all measuring attachments, lateral or vertical dimensions can be measured to within .0001 of an inch, and angles can be measured to within 5 minutes of arc—accurately and rapidly!

Photograph courtesy of Stor Machine & Tool Campany, Cleveland, Ohio



JONES & LAMSON

MACHINE COMPANY Springfield, Vermont, U.S.A. Manufacturer of: Universal Turret Lathes • Fay Autematic Lathes • Autematic Double-End Milling and Centering Machines • Autematic Thread Grinders • Optical Componeters • Autematic Opening Threading Dies and Chesers.

Here's how Apex helps users of Phillips Screws!

PEX bit holders revolutionize the use of Power Bits and Hand Drivers for Phillips Recessed Head Screws, Here's what they do:

Save you money after original installation of holders is made because they eliminate necessity of carrying so many different sizes of screw driver bits. Only items necessary to carry in stock are the insert tips. One range of inserts fits various sizes of holders.

Save vitally needed critical steel and release it for other war time needs.

Jule Increase bit life due to the float between insert and holder, allowing for easier alignment with recess in screw.

driver bits because it is no longer necessary to return screw drivers for reconditioning as cost of inserts is approximately that of the reconditioning charge.

Send for Bulletin No. 102 giving complete details.

APEX

THE APEX MACHINE & TOOL COMPANY • DAYTON 2, OHIO Menufacturers of Power Bits for Phillips, Slotted Hood and Clutch Head Screws; and Head Tools for Phillips and Clutch Hood Screws.





ROTARY FILES

TUNGSTEN CARBINE
GROUND from the SOLID

In line with the growing use of Tungsten Carbide tools, the Charles L. Jarvis Company has developed over the past few years a Ground-from-the-Solid Tungsten Carbide file which, from past experience, has proven to be extremely economical wherever standard High Speed Steel Ground-from-the-Solid Rotary Files are used.

It is possible to make extreme claims as to the life and cutting speed of these new type rotary files and experience has proven that if these tools are carefully salvaged for regrinding, the rotary file costs can be cut to a fraction of the High Speed Steel files.

Send For New Catalog

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS . FLEXIBLE SHAFT MACHINES . GROUND ROTARY FILES
OUICK CHANGE CHUCKS AND COLLETS

GET THE JOB DONE!



You can RELY on Marshall-town Presses TO STEP UP YOUR PRODUCTION! They are engineered and built to give you the best in dependable, trouble-free service, and they incorporate many outstanding advantages. Features of design include more die space—chrome molybdenum cranks, wrist pin connections.

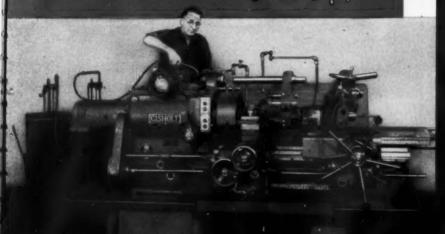
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MARSHALLTOWN PRESSES Get the facts today shout Marshalltown

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HOW MANY MILES' for the Oil in your TURRET LATHE?



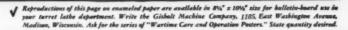
V CHANGE OIL IN RESERVOIRS REGULARLY

The oil in your turns lathe upons out—turns into studge—the seems as the oil in your car.

√ use only recommended GRADES AND

TYPES OF OIL—Choop oil is nover chasp.

uscornect grades of oil can gum up fine oil pessages
and moult in secious and expensive trouble.



It Will Pay You To Check Up On This WADE TOOLMAKERS' PRECISION LATHE





Bench Lathes and Profilers For Precision, Versatility And Stamina This No. 8-A Wade Toolmakers' Precision Lathe will meet your every requirement as to precision, versatility and stamina . . for it is a carefully built lathe with many important features. The spindle has a 1" collet capacity, and is supported in a double row roller bearing, close to the nose. Thrust is taken on a precision ball bearing. The bed is 44", with 8½" swing. It is built on the correct principle of narrow guideways with broad wearing surfaces; it has lasting accuracy and the ability to take the heaviest cuts. The rugged tailstock spindle always has a bearing the full length of the barrel, has a scale graduated in 1/16ths, and a micrometer dial. It has a quick change gear box, and cuts threads as coarse as 6 TPI. Exceptionally close tolerances are possible.

With today for catalog

THE WADE TOOL COMPANY

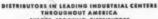
WALTHAM 54: MASSACHUSETTS



COLD-TEMPER - the new deep-freeze treatment at 120° below zero that gives every Threadwell High Speed Tap extra hardness through and through yet makes it less britzle. It means better threads and more of them per tap both before and after re-sharpening. It's ideal for tapping steels, cast iron, alloys, even plastics and other abrasive materials. Trial will readily convince you of the extra performance and value of Threadwell COLD-TEMPER Taps, yet they cost no more than taps receiving only the usual heat treatment.



'i-dat-ification' - a sure, quick way of identifying the right tap for the job red dot for high speed cut thread, white dot for commercial ground, blue doc for precision ground.



EXPORT STOCKING DISTRIBUTORS CANADA, Bridge Machinery Co., Mentreel, BNGLAND, Skylux Ltd., London and John H. Graham and Co., Inc. THROUGHOUT THE WORLD

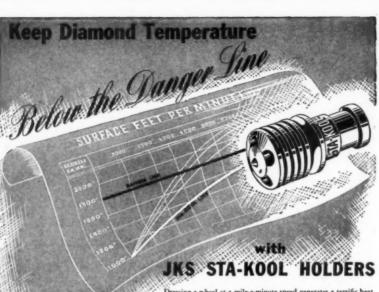
Top-Caprale - every Threadwell ground thread tap in its individual transparent plastic tube for complete protection plus instant identification without unwrapping.

Greateless Rust-Proofing - Threadwell Tapa are always clean and dry to handle, always ready to

Personal Attention - your order for taps gets it from Threadwell and from the Threadwell distributor in your locality, who has been carefully selected to provide you with prompt and intelligent tap service. Why not get in touch with him next time you order taps and see for yourself how these combined points add up to your immediate and lasting benefit.



THREADWELL TAP AND DIE COMPANY - GREENFIELD, MASSACHUSETTS, U.S. A



Dressing a wheel at a mile-a-minute speed generates a terrific heat

in the diamond tip of a dressing tool. Whether or not the stone becomes red hot, heat can play havoc with a diamond - cause checking and reduce strength even after proper resetting.

In a single point diamond tool . . . where four-fifths of the stone is generally set below the surface collecting heat and transmitting it to the holder . . . the J. K. Smit & Sons patented STA-KOOL holder removes all possibility of damage from overheating. Its internal ducts and fins allow quantities of coolant to pass around, through and under the metal setting. Setting and enclosed portion of the diamond are efficiently cooled. Excess heat created in the diamond point has no chance to accumulate inside the tool, but instead is dissipated in the larger cooled portion of the stone and setting. With proper use of the correct size STA-KOOL tool for the job, temperatures never rise above the Danger Line. Specify STA-KOOL holders . . , available for all makes of machines.





58% longer life on the job. Put this "American" Wheel to work on your swing grinders and floor stands!

Write for information.

RICHMOND SOUARE PROVIDENCE 1. R. L.

Tools That Offer No "Conversion" Problem

The same O K SYSTEM of Metal Cutting Tools you have found such a help in meeting war production schedules will fit into your postwar set-up like a hand in a glove! Their correct design and marvelous flexibility will put them to work on any metal cutting job your peace time products may demand. Money put into such equipment is a permanent investment. Here are some of the "dividends":

- · Longer edge life.

- Wider range of cutting edges.
 Improved cutting quality due to more accurately controlled heat treatment.
 Greater strength through more scientific pro-
- portioning of stresses and strains.
 Greater adaptability to widely varying work.



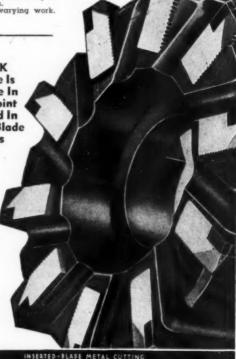
The OK Principle Is Available In **Single Point** Tools and In Multiple Blade Cutters



GRIDDING CUTTERS

FREE BOOKLET ON HOW TO GRIND CUTTERS

This useful booklet is a complete rectise on the grinding of milling cutters. Profusely illustrated, clearly described. There is no charge for this booklet.





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UMPS -FOR MANY USES PRECISION MADE - RELIABLE

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-for Lubrication - Supplying Coolant - Circulating Purposes Transfer Work-Hydraulic Installations

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Available with Sour, Helical and Herringbone gears with capacities from 1/2 to over 37 G.P.M. at 0 lbs., and for pressures up to 500 lbs. per square inch. Bronze pumps for water and saline solutions. Also reversible types for equipment that reverses.

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Maintains same direction of delivery when rotation is re-.23 to 1.37 G.P.M. at 0 lbs. varsed.

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Capacities 3 to 18 G.P.M. at 0 lbs. Electrical characteristics cover wide range of current supply.

MOTOR DRIVEN CENTRIFUGAL

Capacities with water up to 70 G.P.M. at 8 ft. head. Submergence types. Also compact types; one with motor having an integral mounting bracket as shown above and another with integral flange mounting which serves as intake.

SPECIAL

Designs of Brown & Sharpe Pumps lend themselves to special installations—for use as duplex units—and for flange mount-

Pump Catalog showing complete line of Geared, Vane, Motor Driven and Centrifugal Pumps sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



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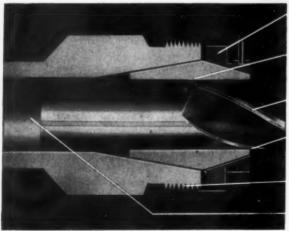
BROWN & SHARPE

UNIVERSAL COLLET CHUCK GRIPS TOOLS TIGHT AS A VISE

Permits Greater Speeds and Feeds Without Tool Flutter

Because they grip tools tightly on a continuous surface instead of at only a few points, Universal Collet Chucks reduce wear and breakage of drills, end mills, taps, etc. Their positive gripping power assures greater feeds and speeds over long periods, increasing production. By reducing locking effort 50%, they save valuable production minutes. They grip drill flutes, permitting stubbing. They will hold six tons in a longitudinal direction and fifty foot pounds in a radial direction. Write for complete information.





Nut tightens on floating sleeve, reduces locking effort 50%.

Collet grips on continuous surface — not at 3 or more points.

Grips drill flutes, per mitting stubbing.

Guaranteed run out .001", one inch from chuck.

Hardened and ground threads.

No back up screw required for thrust.





NIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN 🚁 Fighter Plane Given by Employees 📵 Employee Bond Deductions





TEMPLATES ACCURATE TO # .002" PRODUCED WITH A WIEDEMANN R-43 IN A FRACTION OF TIME TAKEN BY ORDINARY METHODS

New and revolutionary times have been set in accurate template making with the B-43 Micro Turret Punch Press.

The templates are punched, the hele size accurately maintained, and overall center distances held to $\simeq .007$ ". Two rotating turrets carry the required punches and dies, and thereby eliminate individual set up. A safety mechanism prevents tripping the press until the turrets are locked in alignment . . . shearing of punches and dies is eliminated.

No layout is necessary. Accurate lead screws, with direct reading dials graduated in thousandths of an inch. assure easy positioning and accurate dimensions.

The lead screws operate at right angles to each other, are absolutely square with each

Dimensioning can be done from the ends

of the template or from the center lines. The Micro Turret Punch Press is a method of production whereby all elements necessary to produce accurate templates, inspecpiercing templates and many types of flat drill ligs have been combined for maximum efficiency of motion and effort.



Diesel Engine Cylinder Liner Held in Air-Operated Chucks on Sundstrand Automatic Lathe

Fast, precision chucking of this large cast-iron cylinder liner is obtained with dual Logan air-operated chucks, controlled from a single valve. The workpiece is held in a 3-jaw drioing chuck and a duplex type tailstock chuck with 2 pairs of jaws operated independently to facilitate loading.

Your chucking applications can be handled with similar effectiveness on standard Logan air or hydraulic operated chucks. Production is increased ...important savings in idle machine time and operator fatigue can be obtained. High accuracy and finish are maintained. Rejects and spoilage are minimized. Apply these advantages to your work...investigate now.

Logan Rotating Air Cylinders Provide Required Chuck Action

To accurately position and clamp the part, Logan rotating air cylinders actuate both chucks on this job. A tandem type cylinder provides independent control of each set of jaws on the tailstock chuck. Logan rotating air cylinders are available in standard sizes to fit most applications; special bore and stroke furnished to specifications.

Write for FREE Literature

Ask for catalogs and engineering advice on air and hydraulic operated chucking systems. No obligation.





DURABONDED METALITE FIBRE COMBINATION DISCS



Yes ... THERE'S STILL A WAR ON

... and one of our greatest war contributions—DURABONDED CCATED ABRASIVES—will be an even greater boon to peacetime grinding and sanding after V-J Day.

When "cost-per-piece" once again becomes a competitive factor, Durabonded Coated Abrasives, averaging 25% more pieces per belt, disc or sheet, will cut postwar grinding and sanding costs just as they are here speeding aircraft propeller manufacture for war.

Durabonded Metalite Fibre Combination Discs are tougher and more durable. They resist the heat and loading encountered in high speed sanding and they assure greater job economy because they cost no more. The Behr-Manning perfected "hardened bond" makes them that way.

Let us demonstrate the efficiency of Durabonded products to you on your work. Just drop us a line on your company letterhead. Our nearest Field Engineer will do the rest.

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma.

Photo courtesy Curtiss-Wright Corp.



BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)

Quality Coated Abrasives Since 1872

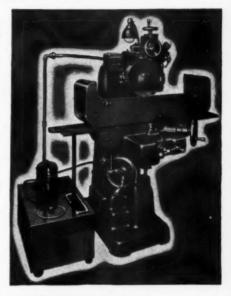
GVEL No. 15 SURFACE GRINDER

Is A Versatile Time Saver!

On short production runs... multiple toolroom jobs... the COVEL No. 15 with its quick set-up feature and operating flexibility will save extra production hours for you every month. For accurate grinding of odd sized pieces in small quantities, it can't be beat because:

- * There are no dogs or feeds to change.
- ★ All controls are in front for clear vision.
- ★ Operator drives table feed to fit finish.
- * Holds to close tolerances.
- * Rugged COVEL Spindle is completely dust protected.
- ★ is adaptable for wet or dry grinding.

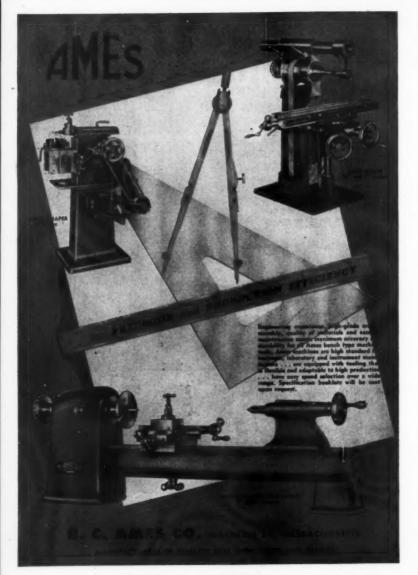
Typical COVEL No. 15 Hand-Feed Surface Grinder set-up shows grinding V-blocks in toolroom. Table is 6" x 18"; transverse travel 7½", vertical travel 11". Portable, roller mounted unit for wet grinding comes complete with motor, splesh guards and pump—adds materially to versatility of grinder.





See Your Nearest
COVEL Dealer
or Write for
BULLETIN
MT-65

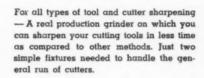




The Fastest...PRODUCTION TOOL GRINDER

on the Market*

*Actual statement of a user of several machines.



The Ace is easy to set up — fast and simple to operate — operator stands in a comfortable position — clearance by direct reading — radial relief if desired.

The Ace is doing a BANG UP job for both Cutter Manufacturers and Users. Its many features will appeal to you. Make your next cutter grinder an OLIVER ACE.

Send for Literature Today. Prompt Deliveries.

OLIVER INSTRUMENT CO.

1408 E. MAUMEE ST. ADRIAN, MICHIGAN

OLIVER

Don't Neglect Your Toolroom It's the Backbone of Production!

AUTOMATIC DRILL GRINDERS — TOOL AND CUTTER GRINDERS —
DILL POINT THINNERS — TEMPLATE TOOL GRINDERS —
FACE MILL GRINDERS — DIEMAKING MACHINES

Cut illustrates the

ACE Universal Tool and Cutter Grinder

with Anti-Friction Head — handles a complete range of

cutters and tools.

Precision ONING

of diameters from .185" to 2.625" with a guaranteed accuracy of .0001"

With the Sunnen Precision Honing Machine you can hane and finish any internal cylindrical surface in any metal or plastic except lead or babbitt. Holes are straight and round and the surfaces produced are super-smooth—often from 2 to 3 micro-inches. This means longer life of parts, fewer rejects, and greater interchangeability of parts.

Here is a real precision machine that will increase production without the need for skilled labor. Any mechanically inclined worker can learn to turn out precision work in a few hours' time. Let a Sunnen engineer show you how it can be used in your shop—on your jobs—or write for bulletin giving complete information on all the advantages of this machine.

SUNNEN PRODUCTS CO. 7935 Manchester Ave., St. Louis 17, Missouri
Conadian Factory: Chatham, Ontario

Speed + Accuracy + Finish

CHICAGO

STEEL PRESS BRAKES—HAND AND POWER BENDING BRAKES-AND DIES FOR ALL STANDARD MODERN PRESS BRAKES



BOX AND PAN BRAKE-

Forms boxes or pans from one piece of metal. A straight brake as well as a box brake. Ideal for experimental shops.

All Chicago Brakes are built of rolled steel welded sections which insures great strength, accuracy and long life.

Up to the minute in design and workmanship, they fit the present need for fast production sheet metal working machinery.

We also build special machines for intricate bending operations.

Take advantage of our experience of over 40 years by sending to us any difficult bending problem you have.



POWER BENDING BRAKE-

Indispensable wherever a volume of heavy plate work is done—forms a great variety of bends and shapes without dies.



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Improved to meet modern needs. cient and dependable-sturdy and durable.



PRESS BRAKE

Compact, powerful money-saving pro-duction unit. Replaces cumbersome costly machines that are expensive to operate. Uses same dies as larger machines.



LARGE PRESS BRAKE

The only press brake which turns out perfect work without shims and crowned dies. Pat-ented non-deflecting bed equalizes pressure over the full bending length and overcomes major fault in solid bed press brakes.

DREIS & KRUMP MANUFACTURING CO.

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SEND FOR NEW BOOK "FORMING PRESS DIES AND THEIR USES"



INGERSOLL Inserted Blade CUTTERS

HALF SIDE MILLS . FULL SIDE MILLS . STAGGERED TOOTH SLOTTING . CHANNELING . INTERLOCKING



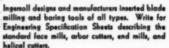
INTERLOCKING



Ingersoll inserted blade arbor cutters are replacing solid high speed steel and solid brazed tip designs due to economy of replacement blades. It is not necessary to purchase complete

new cutters, as only the inserted blades are perishable. The cost of a new set of blades is much less than the cost of a new solid type cutter.

There is an Ingersoll inserted blade cutter for all straddle milling, keyway cutting, channeling, or slotting operations requiring cutters from 4" diameter and 34" wide up to any size that may be required. Several different styles and types are illustrated here and each has its particular field of application. Cutters may be furnished with high speed steel, cast allay, or carbide tipped blades, and with cutting angles suitable for cast iron, steel, aluminum, or any other non-ferrous allay.





HALF SIDE MILLS



STAGGERED TOOTH SLOTTING



CHANNELING

3 -LOCK MARROW SLOTTING



WALL CHART

Wall chart suitable for mounting in tool room illustrating proper grinds for milling cutters,



Watte for INGERSOLL CUTTER GRINDER BULLETIN

describing operation of machine and fundamental principles of good cutter grinding.



FULL SIDE MILL



es, in a number of big war plants important operations are being performed in 1/2 to 1/7th the time of previous operations. In one plant, Large Hollow Spindle Type of HYDRATROL LATHES are saving 15,000 man hours per month! Why not let us show you what a HYDRATROL LATHE could do in your plant?

5 SIZES - 18" to 36"

Small., 18" up to 7¼" Hole Large 30" up to 14" Hole Medium 24" up to 12" Hole Large 36" up to 16½" Hole Large, 27" up to 13" Hole (Standard Type lathes 16" to 36")

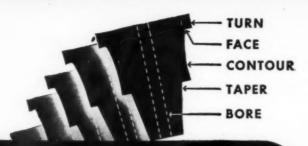
7 Distinctive Features:

- * Easy, Fast, Simple Operation.
- * Hydraulic Brakes and Clutches.
- * Absence of Mechanical Troubles.
- ★ Automatic and Ample Lubrication. ★ Mechanism Protected by Automatic
- Control.
- ★ Extraordinary Hardness of Bed.

Available with Large Turrets for carriage which fully utilize the Great Power Capacity of these machines; and Beds on both ends of Headstock.

ehmann Machine Company

CHOUTEAU AT GRAND * ST. LOUIS 3, MISSOURI



PERFECT DUPLICATION

in one quick setup

... tomorrow or a year from tomorrow

Setup to produce a job like this can be made in a few minutes on a Monarch Magnamatic, for automatic running of even small quantities, accurately and economically. The thin metal template which guides the tool can be used for perfect duplication at any time.

Ask our representatives for details on how you can profitably use this fully automatic, allelectrically controlled Magnamatic for war production or peacetime operation.

THE MONARCH MACHINE TOOL COMPANY . SIDNEY, OHIO

Monarch Saves Time



Do it with DALZEN

Les Dalzen U. S., becute White orthory of the and Special resign produced in a representation of the special or tungsized or tungsizen carbide.

Left: High speed ground thread milling cutters, scientifically heat treated for longer life,

Dalzen manufactures an extensive line of precision cutting tools, parts, thread grinding and special machines—engineered for maximum efficiency and economical operation. Each is the result of years of experience on the part of designers and craftsmen. These are reasons why, all over the United these and in many foreign countries, master in its who have used and worked with Dalzen. Write for details and to be rewith Dalzen. Write for details the box Dalzen and oit better for you.

Be No. 5 Ele Threa in Threa in the ciency accuracy accuracy accuracy wheel speed, other features.

Right: No. 1
Thread Grinder.
Compact, upright
design saves floor
space. Simple to
operate. Low first
and maintenance
cost, ideal for short

y: Dalzen "2in-1" combines a depend to le accutate cema l'apping machine ich a

DALZEN

TOOL AND MANUFACTURING CO.

re thread pound exactyto your speiffications. Rigid inspecion assured uniform lise finish.



Yours For The Asking — This new bulletin is packed with the kind of complete hydraulic press data you want. Note in the typical page above how the conveniently tabled specifications and detailed drawings give you facts quickly—without fuss or frills—on Denison's complete line of standard HydroILic presses in the 5- to 200-ton range. And in addition, you'll find the tables on pages 19 to 29 a most helpful collec-

tion of hydraulic engineering data. Write for your copy of this new bulletin today . . . on your company's stationery, please. The Denison Engineering Co., 1184 Dublin Rd., Columbus 16, Ohio.

DENISON

Hydrollics



Here is a close up showing how the main tool slide stroke is set by an adjustable dog on the worm wheel.

EASY TO GET AT. Loosen four clamp screws and remove the cover indicated in the picture above. This exposes the worm wheel of the main tool slide drive mechanism. On this worm wheel there are two dogs, one of which controls the terminal point of rapid approach and the other engages rapid return at the end of the feed stroke. The latter is set at the factory and requires no adjustment.

NO CAMS. On the GREENLEE "6" the main tool slide is operated by a rack and gear mechanism. The purpose of this design is to permit greater flexibility in setting the tool-slide feed stroke and to provide a quick and easy means of adjustment.

SIMPLE ADJUSTMENT. To set the feed stroke

of the main tool slide, you simply loosen the feed dog and adjust it to the desired length of stroke. This can be done in five minutes or less. The worm wheel carries a graduated scale for making the setting. Thus, when the feed dog is set at the 1" mark, the tool-slide feed stroke will be 1".

MANY OTHER FEATURES. This description of the main tool slide adjustment shows how simply and rapidly this important set-up adjustment can be made on the GREENLEE "6". In addition, there are many other practical features of set-up and operation which have caused this machine to be often called "the Operator's Favorite."



GREENLEE BROS. & CO.





DO IT WITH A DUOMATIC

Accuracy and uniformity are essential in cutting V-grooves in V-belt sheaves. This assures proper belt seating, equal pull, and maximum transmission of power.

With the Duomatic—Lodge & Shipley's full automatic lathe—you get accuracy and uniformity PLUS exceptional speed in production. For on the Duomatic, dual carriages and tool slides permit far greater multiple tool operations, front and rear... cut many more sheaves at the same time. Illustrations show L & S Duomatic Lathes

in the light duty sheave department of the Dodge Manufacturing Corp., Mishawaka, Indians. Multiple tools, front and rear, cut 5 V-grooves at one time in Dodge precision-built D-V Sheaves. As groove shapes and pitch diameters must be identical Duomatics are used to meet every precision requirement and to effect outstanding savings in production time.

Call on L & S Engineers to show you how the Duomatic can do a better, faster job on V-belt sheaves. For detailed literature, write on your company letterhead for Bulletin 601.

THE ODGE & HIPLEY MACHINE TOOL CO.

CINCINNATI 25. OHIO. U.S.A.

ENGINE -TOOL ROOM - AUTOMATIC - OIL COUNTRY LATHES

Lather S

PRELUBRICATED SEALED BALL BEARINGS...NOW STANDARD ON TYPE CSP MOTORS UP TO 3 HP

Bought now, Westinghouse Type CSP Prelubricated Motors need no greasing till 1950! Extensively field tested in thousands of textile motor applications, the prelubricated ball bearings in Westinghouse Type CSP general-purpose motors have proved they can operate five years . . . 24 hours a day . . . without greasing. Overgreasing and consequent grease seepage into windings is eliminated. One of the major items of induction motor maintenance, periodic greasing, has been reduced to one grease packing job in five years.

Every Westinghouse Type CSP Motor up to 3 ho carries the "Prelubricated" label. For complete information on how the Type CSP Motor can reduce your maintenance, write for D.B. 3100-CSP. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. 12313174

FORGET LUBRICATION... till 1950!

ADVANTAGES OF WESTINGHOUSE TYPE CSP PRELUBRICATED MOTORS

- ^a Prelubricated Sealed Sall Searings reduce lubrication maintenance... assure longer grease life
- ⁰ Improved Tuffernell Insulation
- ⁰ Dynamically Belenced Reter
- Die-sest Reter with oversize fan
- ⁰ Liberal Through-ventilation—air enters front,



SUPPLY
OF GREASE
SNAP RING
REMOVABLE
SEAL
SNAP RING

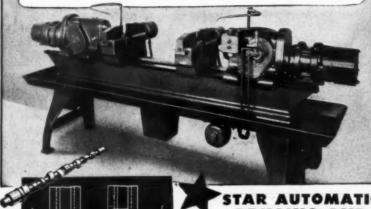
DOUBLE - WIDTH BEARING

Westinghouse



Type CSP Motors

For High Production Drilling and Centering



Conventional type of motor can shaft showing air operated equalizing fixture for centering host code.

DRILLING AND CENTERING MACHINE

◆ The Star Drilling and Centering Machine provides a better method of centering work on a production basis, yet it is flexible enough to permit economical changeover when necessary.

Two motor-driven independent "heads" each with its own closed cycle and independent speeds and feeds are arranged to operate in timed relation to each other. The heads are-built for high speed and long life. Each head is provided with a hardened steel barrel cam which imparts the feeding movement to the spindle and makes it possible to vary the "feed" stroke to suit individual operations. Cams may be easily changed to meet varying conditions. The distance from bed to spindle is ample to provide sufficient room for special work holding fixtures,

should they be necessary. Standard quick-acting, equalizing vises are available and may be arranged to operate singly or in pairs.

The standard cycle provides rapid approach, feel, withdrawal near end of feed stroke (to clear-chips) and a slow final feed insuring a smooth accurate center hole. Other variations of this cycle are possible so that one end of a shaft may be drilled, centered, and counterbored while the other end is being centered.

We welcome your inquiries. Our engineering department is at your service.

SENECA FALLS MACHINE CO. Seneca Falls New York

held for contering in single air operated fixture.

Alr operated fixture for

holding steering hanckle

og, while centering on



draulic presses . . . miscella-

neous wheel operated pro-

duction presses, straighten-

ing presses, and portable

general purpose presses.

Dake Straightening Press...one of two 15 ton models. Designed for general straightening work such as aligning crank operations.

Deliveries are good on most Dake Arbor Press models. For full information about the Dake line, mail the coupon below. Get a personal copy of the Dake catalog. All inquiries or orders should be addressed to Dake Engine Company, Grand Haven, Michigan.



DAKE ENGINE COMPAI

Get Easier Cutting and Longer Saw-Life

ON MAGNESIUM, ALUMINUM. PLASTICS, HARD WOOD



Soft materials like the light metals, plastics and wood all turn up extra-large chips when cut. So saws used in this type of cutting need extra-large gullets to clear these big chips...saws like Simonds Skip-Tooth Band Saws. This type of saw has coarse teeth...2, 3, 4 and 6 per inch... yet the gullet is shaped so that even the narrower blades have maximum strength in the body, the teeth only being hardened. So you can bank on it

that these new Skip-Tooth Saws will stay sharp so' long that you'll get your money out of them long before they dull... which means you can economically replace with new blades and cut out all sharpening costs. See your dealer or write direct; to Simonds.

BRANCH OFFICER: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ht.; 228 Firm St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 416 West 8th St., Los Argules 14, Calif.; 31 W Trans Ave., Spukane 8, Wash.

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PRODUCTION TOOLS
FOR CUTTING METAL,
WOOD,
PAPER, PLASTICS

SIMONDS SAWAND STEEL GO.

HYDRAULIC

A Single Accumulator Serves Any Number of Presses



POWER

An Elmes accumulator system for group-operation of hydraulic equipment provides a flow of smooth, abundant power from a single, dependable source.

One pressure vessel and one or more pumps, with functions coordinated by Elmes patented controls, can serve any number of production units, satisfy wide demand fluctuations, and maintain an ample power reserve.

Elmes accumulators have no internal moving parts. Their pistonless design requires no packings. Compressed air ballasting assures uniform flow without line shocks; gives close pressure regulation for fast press operation.

Simplified Elmes controls prevent excessive and insufficient pressures and excessive withdrawal, while protecting the accumulator supply from line failure. Safety valve protection prevents excessive pressure rise in high-temperature environment.

Send for Bulletin No. 5100. More than fifty years of accumulator building experience is yours for the asking.

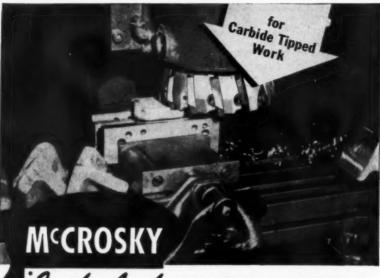
ELMES HYDRAULIC

Elmes hydraulic accumulators are made in all sizes and pressure capacities. They afficiently, simple to install, occupy little space, and usually can be set on factory floor. When requesting literature, please also ask for bulletin No. 1020, "Elmes High-Pressure Pumps."

ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, 244 North Morgan, Chicago 7, Illinois

Also Manufactured in Canada

METAL WORKING PRESSES PLASTIC HOLDING PRESSES - EXTRUSION PRESSES - PUMPS - ACCUMULATORS VALVES - ACCESSORIES



Jack-Lock MILLING CUTTERS

Taking a ¼" to ‰" cut in 1430 steel heat treated forgings, with spindle speed of 218 R. P. M., 14%" feed, and .0045" feed per tooth, this carbide tipped job demonstrates the

Conceived and perfected by McCrosky engineers, the Jack-Lock wedge gives inserted blade tools the strength and rigidity of solid tools,—yet permits easy and quick release of the blades without hammering. Fine pitched screws in back of each blade assure uniform adjustment for regrinding, resulting in minimum blade loss,—more accurate and speedier regrinding—permitting a job to be kept in continuous production with fewer, sometimes only a single standby tool. Specify "McCrosky" for more production and lower costs.

advantages of McCrosky's Jack-Lock construction.

MCCROSKY

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TOOLS Q-L

Designers and Manufacturers of sche-Lack Milling Cutters

Block Type BORING BARS

Super Adjustable REAMERS CHUCKS AND COLLETS

Torret TOOL POSTS

ONE LEVER-

provides complete control



Single lever hydraulic control of RACINE'S Heavy Duty Metal Cutting Saws marks a new era in the efficiency of metal cutting machines. Gone are cams, weights, ratchets, levers and other outmoded methods of applying feed, lift and other operating functions. RACINE Machines are rugged in construction, and accurate, representing 36 years of constant research and improvement.

RACINE'S complete line includes capacities from 6" x 6" to 20" x 20". Write for our complete Catalog No. 12. Also outline your metal cutting operations. Our engineers will supply definite recommendations without cost to you. Address RACINE TOOL AND MACHINE Co., 1754 State St., Racine, Wisconsin.

comparison proves

- Design based on machine tool standards incorporates modern hydraulic principles.
- ♠ Progressive feed — each tooth removes a long curled chip.
- Insures capacity production in every shop.
- Rugged construction — troublefree operation these machines stay at work.

Racine Oil Hydraulic Pumps .. A Modern Source of Hydraulic Force

The flexibility of your hydraulic circuits can be increased with Ra-CINE "Variable Volume". Pumps. Three sizes: 12, 20 and 30 G.P.M. Pressures 50 to 1000 BP. P.S.I. Ask for our Catalog No. P-10-C. Give us a summary of your hydraulic problems.



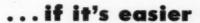




Occupying a prominent place on the production line of American Industries is the standard type AVEY Drilling Machine. Sturdily built to give longer operating hours, smoother performance and lower maintenance. A wise investment because it does your war job now — your peace job later, with no time out for conversion.

This Avey Drilling Machine, Type MA-6, is now being built in No. 2 size (capacity in cast iron, %"). No. 3 size (capacity in cast iron, 1¼"). One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above photograph shows the MA-6 equipped with three spindles, the Aveymatic Feed, Hand Feed and Tapper.





to move the saw to the work

WELLS No. 8





SPECIFICATIONS WELLS No. 8

WEIGHT: . Approximately 750 pounds

WHY waste time and manpower moving stock to a fixed saw—it's easier to roll a portable Wells right where you want the cutting done. The Wells cuts quickly, most any shape or size metal you can get into it... with a minimum of labor. Easy to use, economical, this handy Wells No. 8 frees larger units for production work, pays for itself in time and labor savings. Write for details.

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION 707 COOLIDGE AVE., THREE RIVERS, MICHIGAN



Hard-Surfaced

WORK REST BLADES

FOR CENTERLESS GRINDERS



A new Scully method of flowing Stellite to a generous depth produces Work Rest Blades with greater wearresistant auglities.

The tough Stellited edge has less tendency to chip or flake so scratching and scoring of the work piece is essentially eliminated.

Fewer regrinds and reduced setup time permit the continuous Centerless Grinding of long-run jobs with a consistent degree of precision accuracy.

An economical price effects a substantial saving in cost.

MAIL NOW!

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OPERATORS of Axelson Heavy Duty Lathes reflect the sterling qualities of the machine itself. There is no anxiety about productivity as they put this machine tool through its paces. Axelson Lathes have been invested with thirty years of constant improvement, and today the machine is competent, "fool proof," versatile and economical to operate. . . In the big job that lies ahead, as the Axis is driven from the world it sought to rule, reliable lathe work will be an all important feature of reconstruction. . . Plants which have been "all out," in the battle of production, will have to be completely overhauled. . . Lathe work will feature this kind of operation. . . Vast mechanisms wrecked by war in Europe, will be restored by machine work done in the United States. . Lathes will play a part in that, too, . . And in the great new plans of reconversion, alert industrialists will depend on Axelson Heavy Duty Lathes for their metal turning as they did in production for war needs.

Write for Lathe Bulletin 4401 which describes the whole series of Axelson Lathes in detail. . . . Lay your plans now for future Axelson Lathes, when added refinements can be offered you. . . In the meantime rest assured that there is no better heavy duty lathe than the Axelson.



AXELSON MANUFACTURING CO.

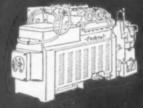
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AXELSON LATHES

Dependable for over a Quarter Century

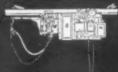
What do <u>you</u> know resistance welding



UTBLITY BURY AND PLASH



SASH WELDER



GUN WELDER

Millions of dollars (and hears) have been seved by the application of resistance welding, in one form or another, to Elevally hundreds of operations in modern manufacture, yet in the midst of a national survey of industrial uses we have come face to face with a starting lock of understanding of what resistance welding is all about.

that this is true of top executives and factory man elike makes it ulmost a national emergency from our point of view... First because of the millions of dollars and production hours that other plauts are losing (and perhaps yours is one of them) in fabrications and assemblies that could be done better with resistance weeking... And also because it is obvious that we have not provided you with adequate, up-to-dute information.

In the meantime, events here moved with relentless measure to point up the fact that in addition to the big were job still cheed. NOW is the time to put your production house in order to most the converting demands of a speeds-hungary world.

the problem will be . . . to make Quality + Quantity + righer (than prower) managemer cost+uncertain material and distribution costs, all and up to a salling price that will survive the floring demonstrate in industrial history.

THE FEDERAL MACHINE



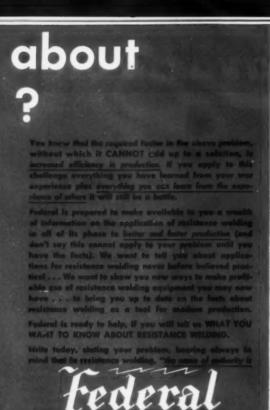
PERCUSSION WELDER



NEAVY DON



WILLY STO



WARREN, OHIO

VERSATILE MODERN PRODUCTION TOOLS

ALUMINUM WELDERS

The limited plastic range of aluminum alloys has always made the welding of these metals an extremely critical problem, has caused many experts to claim that it cannot successfully he done. That it can, has been convincingly proved by the development of resistance welders, both spot and seam welding types, which are now producing aluminum welds of such high quality as to be acceptable for aircraft and other critical parts.

The Federal Machine and Welder Company recently delivered the largest and most modern roll-spot aluminum welder ever built, capable of welding two sheets up to 3% thickness . . . has other available, including spot welders capable of welding two aluminum alloy sheets up to .125° gauge at 150 spots per minute.

NEW SMALL SPOT WELDERS

Soon ready for distribution will be several improved models of small spot welders, so versatile in their usefulness and so low in cost that such users as garages, small metal fabricating shops and factory maintenance departments will find them valuable tools. Information on them is available through The Federal Machine and Welder Company.

RESISTANCE WELDING IN MAINTENANCE

Speaking of maintenance department uses, several plants where application of resistance welding would be least suspected have found small, low cost welders highly profitable for a variety of demands, from repairing or making of sheet metal safety housings to the patching of machine and electrical equipment parts.

2,000 KVA FLASH WELDERS

Among the recent special machines produced by Federal Machine and Welder Company are several 1000 KVA flash welders delivered to a foreign power as part of a complete production plant for making seven to ten foot diameter bearing rings, from hot rolled steel bar stock. Coming up are others of even greater KVA capacity. These particular rings were for tank turrets, but such welders are adaptable to handing large ring gear blanks, locomotive tires. . . many types of bars or rails up to 20 square inches cross section.

OLD TIMER . . . NEW SLOGAN

After several years total absorbtion in war work The Federal Machine and Welder Company, oldest maker of resistance welding equipment, is planning its return to active contact with peace time fields... has a new slogan: "In resistance welding, the name of authority is FEDERAL".

WELDER

now available



FULL INFORMATION on the

"most versatile machine in the shop"

Just off the press—a new catalog on the complete line of Pratt & Whitney Kellerflex Flexible Shaft Machines. Besides details on the different Kellerflex models and their applications, this catalog pictures and describes the various hand-

pieces and attachments, illustrates some of the hundreds of accessories available and how they are used. You will probably discover additional places where the P&W Kellerflex can speed up production, save money. A copy will be sent you upon request.

WRITE TODAY FOR YOUR COPY OF THIS NEW CATALOG

PRATT & WHITNEY

Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DEPARTMENT

WEST HARTFORD 1, CONN.





The popularity of this new Saw Band spread like wildfire through airplane, josp and motor plants, shippards, large and small parts factories. Secause of it, designers and engineers specify more and more of the new light metals, laminates, plastics and plywoods — metal sew eperators double and triple their cutpet.



This mirecle new requires no re-charpening, which means no work stoppeges. Here's one blading you can well afford to use continuously until worn out and then insert a new one. The Buttress cuts all tough materials, including the following:







Plywoods Builders Board Asberton Wood Laminates FREE ENGINEERING AID

If you have any meterial hard to gut, send sample to us for sawing recommendations and receive written labotalory report.

Contract Saving















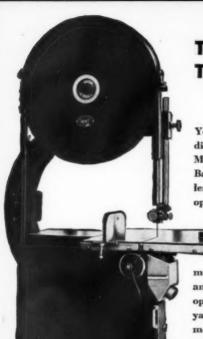




DoALL

INDUSTRY'S NEW SET OF TOOLS

The DoALL Company
215 No. Leurel Avenue - Des Plaines, Illinois



TWO SIZES THREE DRIVES

for most high speed metal cutting operations

You have your choice of 26" or 36" wheel diameters and of Direct Motor, Belted Motor or Belt Drives. Moak High Speed Band Saws are built to provide excellent service under the most strenuous operation. They give cuts which are

> clean and smooth requiring little if any finishing and their speed of operation surpasses all other

methods for cutting sheet metal, ferrous and non-ferrous alloys. Moak Saws are operating in hundreds of mills, shipyards, aeroplane, automobile and other metal working plants. These machines are famed for giving trouble-free service.



SEND FOR THIS BOOKLET

It contains a complete description of all Moak features, many of which are shown in pictures.

Points To Remember About Moak High Speed Band Saws

- All adjustments are made from operators position in front of saw.
 On 36" machine, the table is only 40" above the floor.
- 3. Moak design lessens vibration.
- 4. Tracking Gauge makes possible quick accurate centering of saw blade.

THE MOAK MACHINE AND TOOL COMPANY

Port Huron, Michigan







High Production - Money Making
MULTIPLE SPINDLE DRILLHEADS



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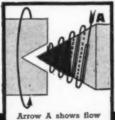
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Arrow A shows flow of lubricant around helical groove.

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June, 1945

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MACHINE TOOL BLUE BOOK

61



- Drill
- Bore
- Ream
- Counter-Bore
- Tap . . .

Fast

Production comes naturally on a three-spindle Buffalo No. 22 like the one shown here. With this set-up, all operations required for the piece being worked are taken care of on this one table and very satisfactory results are obtained.

The complete line of Buffalo drills ranges from the No. 15 bench type to the large motor spindle. All are described in our Drill Binder which will be sent on request. Please use your business letterhead when writing for it.



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Reflex Torque Control by sight, sound and feel—automatically fast, involuntarily accurate.

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RELOCATE AND HOLES TO .0001". IN 1/3 THE TIME



No Lenger is it necessary for toolmakers to labor over buttons and locating plugs to correct holes in hardened parts... not if you use the Moore Jiz Grinder.

You can rely entirely on this unique machine to mechanically relocate and finishgrind straight or tapered holes to exact size and location in ½ to ¾ the time required by conventional methods.

Accurate lead screws built into the Jig Grinder enable operators to guide the work rapidly to precise location within .0001" at the turn of the micrometer dials. This eliminates hours of checking on the bench and surface plate.

Working to figures instead of to "fii", the Moore Jig Grinder takes die-making out of the "one-man" class and puts it en an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die. Multi-section dies are quickly ground in a single set-up... eliminating separate-section hole grinding and the accompanying problems of accurately locating each section in the die bed.

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NEW 25-PAGE CATALOG describes Moore Jig Grinder's application to dies, drill Jigs, gage parts, master plates and production parts.





64

Moore Jig Grinder



did the sensible thing—we kept the complete set-up intact, ready for the next production run. The initial set-up required 10 hours so we'll again be saving that much time on Today, especially, it's vitally important to conserve production time. It takes many hours to

reconstruct multiple cutter assemblies. Save this valuable time by laying aside the complete setup for the next run. Have an extra supply of arbors on hand for this purpose. Remember. arbors are "perishable" tools and their cost today is relatively small. That's why -

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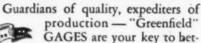


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A manufacturer was making 18-8 stainless-steel eve-terminals for the Navy on a Simmons Micro-Speed No. 2 Turret Lathe . . . cut-off and shape, rough turn, form, spot drill, drill, ream, and circular-form turn.

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Short tool life . . . and poor finish, which necessitated hand-filing, were a problem, until a Sun Cutting Oil Engineer was called in, studied the different operations, and recommended Sunicut. With this transparent, sulphurized cutting lubricant, tool life has increased 25 to 30%; finish is now excellent; the hand-filing has been eliminated. Reamers now last 600 hours; forming tools average 280 hours.

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Loss fetigue because the light-weight tools were easy to move from port to port.

Versatile...adaptable also to 2 1/4" x 3/4" x 3/4" straight wheels for other tight spots.

Perhaps the Rotor Application Engineer can discover savings like these in your shop. The services of this portable tool expert are yours for the asking.

Yours for more production,

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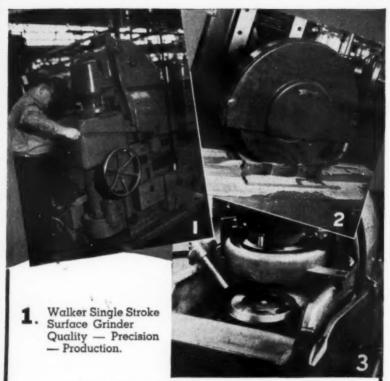
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LEVELAND OHIO

HIGH CYCLE

UNEIASED ANALYSIS OF FORTABLE TOOL PROBLEMS

AIR



- 2. A "Walker" Chuck as used on α well known Surface Grinder.
 - 3. Front view of a "Walker" Grinder. Up-to-date Tool Engineers and Production Men refer their production problems to

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Now's the time to increase spend and efficiency of workers with ARO Pneumatic Tools?

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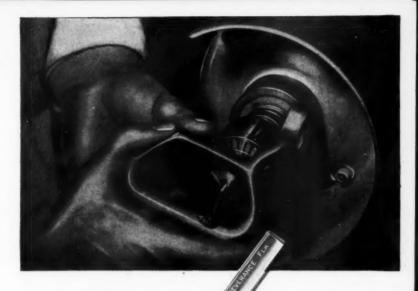
- 1. 3-point base insures even cuts
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- Hydraulic control insures even pressure throughout cut
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SEVERANCE TOOLS ON STATIONARY SET-UP SPEED FINISHING OF SMALL PARTS



Above you see a Severance Midget Milling Cutter being used in a stationary set-up which many manufacturers of small parts have found to be a great time saver. The part is held in the hand, the tool is held in a chuck on almost any type of bench lathe, polishing unit or flexible shaft mounted in a vise.

No matter how they are used, Severance Midget Milling cutters do the job of finishing faster and cleaner than any other type of rotary tool. They take deep, sharp bites and can be successfully reground scores of times. Write for complete facts on how Severance High Speed Steel and "Carbide" Midget Milling Cutters can help you speed up your cleaning and finishing operations.

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FOR THE TOOL ROOM OR PRODUCTION LINE

Milling, Drilling or Boring.
Verniers or Rods and Indicators for locating. Ask the shop that has one.
Better still, ask the shop that has an index and also another of competitive make.

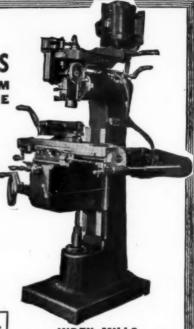
WE are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001", two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8"x16", and troughs for holding rods cross and longitudinal.

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A quality tool for precision work in the tool room or production line, inexpecting such features as bail bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table look that does not cramp table out of alignment—compound trough, 12° size only.



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will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer practical is desired, roots and in the production in the standard equipment for examination and the production half bearing spindle make a very versatile mechine for milling, drilling and hering. Literature promptly mailed on request.

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CONTINUOUS HIGH SPEED CUTTING ON ANY METAL AND ALL SHAPES —

Step-up PRODUCTION in cutting off bars, rods, angles, tubes, etc., to lengths with this accurate, low cost, metal cutting coolant equipped band saw.

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Quick set-up — automatic operation — plugs in anywhere. Saves time and labor. Cuts investment and maintenance.

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Why not make the most of your grinders? To see how easily and inexpensively it can be done, just ask us to mail you Spindle Data Sheet No. 12 "A" and booklet "How to Get Better Finishes On Ground Surfaces."

NO. 24

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simple and inexpensive — holds to limits of .0005" when required it cuts faster and better, always at maximum efficiency, because the belt doesn't load it won't crack, warp, or distort the piece. WE

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For the benefit of the metal working indus-

try we maintain a technical service department. Here our abrasive machining experts study the applications of wet-belt grinding to specific pieces sent to us by

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MOST PARTICULAR GRINDING OPERATORS



SEND FOR NEW CATALOG

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with a distinguished Service Record

Long before Pearl Harbor, Dremel MOTO-TOOL won its spurs by the way it tackled tough jobs in tool rooms and machine shops, and on production lines. But since American industry swung its full strength into war production and our armed forces established far flung assembly and repair bases the already healthy demand for these mighty little midgets has quadrupled.

Operators as well as owners of Moto-Tools are constantly discovering new jobs . . . new ways to save time and cut costs . . . with these pocket size machine shops. Girls quickly become proficient in the use of them because a Moto-Tool weighs but 13 ounces, is shaped to fit the hand, has a balanced armature to prevent vibration. Thousands of Moto-Tools are helping to establish production records in plants such as General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Northrup, Douglas, and many others. Besides, Moto-Tool has won the respect of every branch of the U. S. land, sea and air forces.



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| BE DON FASTER: Sharpening Burn Finishing Grin | OBS THAT CAN E BETTER AND with MOTO-TOOL ing | |
| BE DON FASTER Sharpening Burn Finishing Grin Touching Up Polic | OBS THAT CAN E BETTER AND with MOTO-TOOL ing | |
| Skarpening Burn Finishing Grin Touching Up Polin Sanding Burn Burn | OBS THAT CAN E BETTER AND with MOTO-TOOL ing Cleaning ding Routing hing Cutting ishing Rasping ing Carving | |

A Model 2 Moto-Tool develops 27,000 rpm . . the proper speed for clean, smooth, accurate work, and long life from points and cutters. It is sturdily built throughout and has a shock-proof bakelite housing and oil-less (oil sealed) bearings. Uses 110-120 volt AC or DC current. Ask your Mill Supply salesman or write the factory or representatives below about Dremel Moto-Tools and accessories.

Prompt shipment on orders with proper priority.

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Even in America this vast and varied stock of standard size gages is unique.

And—it enables us to give you unique service. Every order received by mail, wire, phone up to 4 p.m. is shipped the same day—any type, any standard size, any quantity.

CADILLAC GAGE Every Cadillac gage is a masterpiece of the gage-maker's art. This basic material—steel or Stellite—is especially formulated. It is fabricated upon the newest high-precision machinery. Every gage is meticulously inspected to insure that accuracy for which Cadillac Gages are famous. There are none finer!

Phone Us REVERSE THE CHARGES!

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What's your own "slaw-time" problem? You may find the remedy in the new RFC Catalog or in RFC special service.



ROTARY

CONN

12

The SUPER METHOD



of TRIMMING FORMED PARTS and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind.

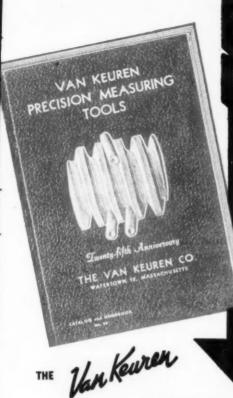
Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.



Write for Your Free Copy HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS

Just off the Press!



The NEW VAN KEUREN HANDBOOK

This new 189 page Catalog and Handbook is a highly useful mensual in convenient reference beam one precision measuring. It describes and illustrates methods and equipment for checking accuracy to handred theasandths one minimized many owners that the second of the Van Keuren equipment described in this new booklet has resulted in many outstanding improvements in prediction and product quality and in vastly simplifying the problem of citatiania classes belowersees in word of all kills.

No. 33

Partial List of Contents

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New Light Wave Equipment with fused quarts optical flais.
New solid square master blocks representing

permanent accuracy.

New and complete geer measuring tables from

5 to 500 teeth.

New Type L Monochromatic Light

ENGINEERING INFORMATION

How to measure standard and special screw

Screw thread data including tables of basic diameters and tap drill sizes for all American threads. Thread proportions for American and Foreign threads.

Bureau of Standards measuring wire specificatio

How to measure helical gears.

How to use optical flats

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Ultimate
Accuracy

THE VAN KEUREN CO., 175 Waltham Street, WATERTOWN 72, MASS.

Kindly send me a copy of your NEW Catalog No. 33. It is understood this request incurs no obligation on my part.

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Position

Company

For Smoother Performance



ATLANTIC Contour Cutting BAND SAW BLADES

You will welcome Atlantic Band Saws in your shop. The teeth are set to permit a smoother performance for radius cutting. The special alloy steel insures longer wear and you can weld them easily.

IMPROVED PACKAGE

One of the strongest, most practical and convenient boxes on the market. Cutaway feature shows inventory at a glance.

Box is solid chipboard construction that won't come apart. Saw

securely held in coil form, no bothersome wires to cut. Required lengths freely removable. Marked on end as well as top of box for easy identification. Packed in all widths 3/32" to 1/2" wide in 100' lengths. Number of teeth as permitted by W. P. B. ruling.

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Send for Atlantic Band Saw Booklet

ATLANTIC SAW MFG. CO., Inc.

Manufacturers of Metal Cutting Band Saw Blades Exclusively

153 Brewery St., New Haven, Conn.

THREE ACES TO DRAW TO



Cen ded you a hand like this your plant!

Kepth Out Utwarmal or Carbida of India will prove to be the finest does anyone the large. They will pay their way and prove? They will pay their way and prove? They will not maintepasse or product production.

Mes and advances teatured here given Knock-Dumber of the Tool Orinder field. The street of the Tool Orinder field. The street of the Tool Orinder field of the street of the theory of the the theory of the the theory of the the theory of the

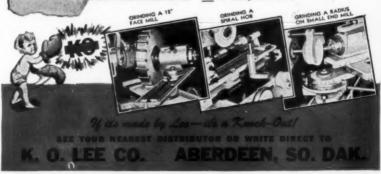
Correct mechine design has placed operating parts where they will function with maximum performance and operator convenince. K-O Engineers have made available more time-tyried firstures and accessories than

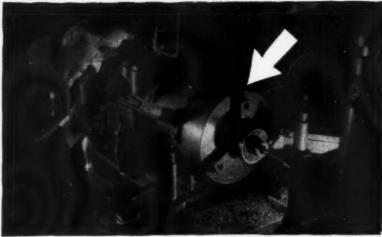
has any other tool grinder manufacturer, thus making \$-0 Tool frinders truly universal. Single-speed or Multis-speed motor heads are available. The K-O DHEAD permits the operator nine speeds from which to select for the job at hand. These speeds range from 1,100 to 11,000 R.P. hand.

Knock-Out Universal Tool Grinders are built to accommodate most any high-speed steel cutters as well as carbide tip tools. R-O Carbide Tool Grinders are built to handle all grinding and sharpening operations necessary on single point carbids tip tools or, if desired, for grinding chip breakers only.

Thinking men are now planning for reconversion. Let us tall you how to include these "three Aces" in your plans.

See your nearest Knock-Out Distributor or write now for catalogue No. 31-65.







1/3 More Parts With a Barker WRENCHLESS CHUCK

Pieces-per-hour went up and stayed up when this P&J Automatic Lathe was equipped with a Barker Wrenchless Chuck. Top output before the change was 18 pieces—the Barker Chuck stepped up production to 24 pieces—an increase of one-third. This user operates six Barker Chucks that are giving uniformly efficient service.

Continuous generous dividends in time saved and increased production are being earned by the hundreds of users of Barker Wrenchless Chucks. Are you interested in similar results?

Write today for full information.

THOMAS HOIST CO.,

Chuck Division

20 South Hoyne Avenue, Chicago 12, Illinois



GONE FOREYER - battered and damaged die sets caused by prying or hammering. ACRO DIE SET PULLERS

do the job the FIRST time. No Delay.

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Use ACRO PULLERS for safe sure separation. They are fast—accurate—
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ACRO PULLERS are indispensable for the grinding, mounting and fitting ACRO FULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height. Order a set today. Convince yourself of the savings you can make in your tool room. ACRO PULLERS furnished in three sizes. Write now for

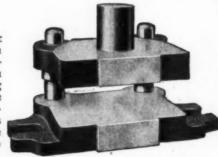
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PRODUCTO DIE SETS

Most of the die set problems involved in the production of metal stampings and in tool and die-making can be solved by one or more of the hundreds of combinations which are available in standard Producto catalog sizes.



Producto can and will fill your requirements speedily; with its five strategically located assembly plants. Your source of supply is the telephone on your desk.

For special applications, Die Sets and Bolster Plates, in any conceivable shape or size, can be supplied from Detroit plants. All accessories (dowels, springs, screws, etc.) also on hand at Assembly Plants.

Distributors of Dickerman Press Feeds and Producto Machine Vises.

Producto Catalog No. 9 can help you save time and money. For speedy service, phone nearest assembly plant.

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New!

WRITE FOR YOUR COPY TODAY

The complete line of Ford Carbide Cutters is described and illustrated in this new 4-page bulletin. All standard styles and sizes are listed, as well as a selective few Carbide Specials which have been made to customer specifications.

Carbides enjoy the distinct advantages of faster cutting speeds, greatly increased tool life, with proportionately fewer regrinds, lower tool inventory, maximum production economy. In actual test they have been shown to outlast ordinary high speed steel by a ratio of fifty to one.

If you are interested in attaining these advantages, write for your copy today.

M. A. FORD MFG. CO., INC. 746 W. FIRST ST. • DAVENPORT, IOWA



smoother balancing longer life

CP SUPER SAFETY BALANCERS

THE outside mounting, an exclusive CP feature, permits the largest possible diameter spring in any given balancer capacity — lessening friction between coils and assuring longer life and smoother balancing. A foolproof retainer-enclosed spring permits speedy spring change. An automatic safety lock — time-saving drum lock, automatic cable lock and other CP design refinements afford lengthened service life and trouble-free performance

CP Super Safety Balancers are available in capacities from 10 lbs. to 200 lbs.; "Midget" Balancers — miniature heavy-duty counter-balance for small tools or objects weighing 10 lbs. or less; Cam Type Balancers, 200 to 500 lbs.

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GKANU KAPIN2 NO. IU-R SUMBINATION TWIST DRILL AND TAD GRANE PROMPT DELIVERY Other Catalog Combinations also available request

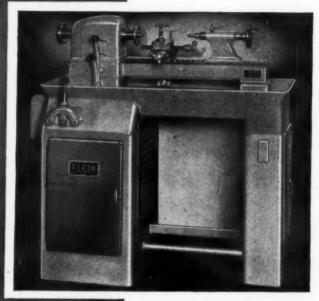
This precision machine tool not only conserves Hi-Speed Taps and Drills but also assures more accurate holes between regrindings.

Sharpens Taps, 2, 3, and 4 Flute, Right or Left Hand. Sizes No. 6 to $1\frac{1}{2}$ inches.

Sharpens Drills, 2 and 3 flute, Straight or Taper Shank. Sizes $\frac{1}{2}$ to $\frac{1}{2}$ inches.

GALLMEYER & LIVINGSTON CO.

• • Makes It



Precision hand screw mdprecision hand screw mdchines, mochines teather
milling all three teath drives,
milling all three teath
arms worlable speed drives,

Note the ample leg room and comfortable foot rest provided for this new ELGIN precision bench lathe. Motor is cross ventilated three shelves are provided on right hand side and collet bar is on left hand door.

ELGIN TOOL

Easy to Get PERFECT RESULTS

In tool room work or precision production ELGINS will do your precision work better, faster and more economically.

ELGIN gives you the latest advances and construction which assure top performance. There are many other ELGIN advantages which mean increased convenience and comfort. For instance the new desk type bases which provide generous leg room and foot rests, permitting operator to sit comfortably close up and directly in front of work.

Motors are mounted in bases with direct cross ventilation. Shelves and collet boards are within handy reach,

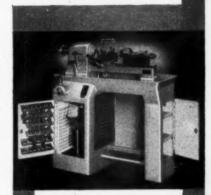
Variable speed drives provide stepless spindle speeds from 40 to 4,000 rpm. Speed controls are centralized and within easy reach.

The new automatic clutch throw-out facilitates free-turning spindle for manual work setting.

The compact electrical equipment is quickly hooked up for immediate operation.

The wide speed range and convenient controls encourage operator to use exactly the right speed for every operation, that means high efficiency in present war production and in future peacetime output. Just check these important facts and let us send you further data and prices.

WORKS CHICAGO 13, ILL.



Note the easy accessibility of drive equipment, Ample cross ventilation assures proper motor operation. The convenient shelves and collet bar provide handy storage of accessories and supplementary equipment.



This sturdy desk type base is designed for heavy duty service. There is ample leg room for operator comfort. Controls are within easy reach and convenient storage space is provided for collets and other equipment.



TURNED, threaded, ground and polished in delicate machines of watch-like precision, more than 30 operations enter into making a WINTER quality tap.

After each operation, a minute inspection and checking by one operator with precision test instruments; and then when the tap is finished, a final checking by WINTER inspectors. PRECISION

TURNING THREADING GRINDING POLISHING

WINTER Taps must be right to the splitthousandths of an inch, before they can leave the WINTER factory.

Let WINTER Engineers solve YOUR tap problem.

A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO., ROCHESTER, MICH.





HREE definite advantages are yours when you use Plan-O-Mill's exclusive Offset Head for external thread milling.

- 1. Lower cutter cost.
- 2. Longer cutter life.
- 3. Better cutting control.

With Plan-O-Mill's exclusive Offset Head you can use a small, solid, low-cost cutter to mill external threads over 114" in diameter. Shown above is a typical application.

Plan-O-Mill is a high production machine for internal and external threading and form milling. It is fast, accurate and economical, producing work of exceptional finish. General Electric Thy-motrol gives separate and complete control of feed-in and feed-around-enables one operator to handle two or more machines.

For war or postwar production, turn now to Plan-O-Milling. Ask your machinery dealer for details or write direct.



- 3. First to install General Electric's remarkable per Thy-mo-trol electric feed control!
- 3. First planetary to mill external threads with stand ard multiple thread cutter?
- First planetary to coordinate feeds and speeds? 4. First to provide absolute control of feed-in!

5. First to offer a practical, low cost carbide thread milling cutter!



PLAN-O-MILL CORPORATION

For that BIG lathe job get 12 station indexing plus HEAVY DUTY construction

Each tool indexes to three different working positions on the ENCO Heavy Duty Turret. Three stations — 30°-50° and 90° for each of the four tools mounted mean less tool grinding and fewer special tools. One tool can be used for facing, turning and champlering. Also threading tools are quickly indexed into position—square with the work while the compound is set at 30°. Enco's 12 stations at 30° each see to that.

Minimum tool overhang and hardened steel construction permit "hogging it off" at high speeds. Ence combines rigidity and strength with maximum flexibility to help you cut lathe time and cost on that his job.



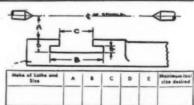
IMMEDIATE DELIVERY

All models can be shipped from stock with machinable base which can quickly be adapted to your lathe. One week required for turrets fitted to specifications.

| Turret Specifications | Model HD-4 | Model HD-3 | Model HD-2 | Model HD-I |
|------------------------------|---|---|---|--|
| Size of Turret Block | 71/2" square 43/4" thick Mac-it Tool Post Screws | 6½" square 4½" thick Mac-it Tool Post Screws | 6½" square 4½" thick Mac-it Tool Post Screws | 4½" square 3" thick Mac-it Tool Post Screws |
| Tool Size Range | 11/4" to 2" or No. 5 toolholder for 5/8" bits | 1½" to 1¾" or No. 4 toolholder for ½" bits | 1" to 1½" or No. 4 Toolholder for ½" square bits | 3/4" to 1" |
| "A" Dimension Range | 3" to 35/8" | 23/4" to 33/8" | 21/2" to 31/8" | 15/8" to 21/2" |
| Shipping Weight Price | 89 pounds \$190.00 | 66 pounds \$150.00 | 60 pounds \$130.00 | 20 pounds \$99.00 |

ORDER TODAY

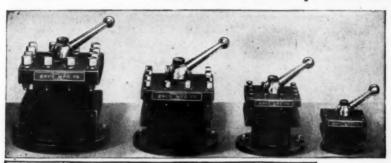
When ordering turrets made to specifications please furnish dimensions shown on the lathe specification chart. Be sure to specify maximum tool to be used. For special center heights write for quotations and recommendation.





TURRET TOOL POSTS

Extreme RIGIDITY



| MODEL | CR-7 | CR-6 | CR-41/2 | CR-31/2 |
|-----------------------------|--|--|--|---|
| MAXIMUM TOOL SIZE | Up to 134" tool or No. 4 Tool holder for 1/2" sq. bit | Up to 1 1/4" tool or No. 2 Tool holder for 3/4" sq. bit | Up to 1/4" tool or 1/4"x 1/4" Tool holder for 1/4" sq. bit | Up to 1/2" Tool |
| SUGGESTED LATHE SWING | 22" to 36" | 16" to 24" | 13" to 17" | 9" to 14" |
| SIZE OF TURRET BLOCK | 41/4" thick 61/2" sq. | 3" thick 6" square | 21/4" thick 41/2" sq. | 1 34" thick 31/2" sq. |
| SPECIFICA- TIONS | 4 Tool 12 position packed in crate. Shipping Wt. 80 lb. Price \$160.00 | 4 Tool 12 posi- tion packed in crate Shipping Wt, 50 lb. Price \$129.00 | 4 Tool 12 posi- tion packed in crate. Shipping Wt. 25 lb. Price \$79.50 | 4 Tool 12 posi- tion packed in carton. Shipping Wt, 12 lb. Price \$55.00 |

DELIVERY
ONLY
5
DAYS
AFTER
ORDER IS
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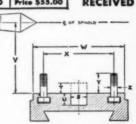
Under high speed production, the new Enco "compound replacement" furret offers you maximum tool rigidity on heavy cuts. By replacing the compound, this new model eliminates possible sources of chatter and inaccuracy—if gibs or screws are worn—and insures you a cleaner, more accurate finished job every time because tools remain on center.

The turret block has 12 indexing positions spaced 30° apart, permitting each of 4 tools to perform more than one operation. A facing tool, for example, may be used for turning by indexing the same tool to next position. This flexibility means standard ground or angular tools may be used without special re-grinding.

Turrets are shipped complete and ready for use withcut further machining. When ordering please furnish all required dimensions shown on the chart.

ENCO MANUFACTURING CO.

Department 48, CHICAGO 39, ILL.



| LATHE | | | SPECIFICATIONS | | | | | | |
|----------|---|---|----------------|---|---|---|---|---|----------------|
| AND BIED | 5 | T | V | ٧ | W | ж | Y | Z | Web, 1450 VERS |
| | - | - | - | - | - | - | - | - | - |

NOTE-

GIVE "S" IN DECIMAL DIM. WHETH-ER PILOT OR HOLE. IF HOLE IS IN CROSS SLIDE GIVE ONLY "U" DIM. IF PILOT IS IN CROSS SLIDE GIVE ONLY "T" DIM.

The FUNDAMENTALS of ... The Ettco-Emrick System of MULTIPLE DRILLING AND TAPPING HEADS

The Etico-Emrick System provides both the method and the equipment for obtaining maximum pro-

duction in the drilling and tapping of small parts at minimum tooling cost.

Two features account for the low tooling cost— (1) The equipment can be used on any drill press— (2) It is made from standardized stock parts.



The System is founded on the four basic elements illustrated, which are as follows:

1-A standard ball-bearing drilling face plate unit which, is clamped to the drill press quilt.

2-A standard centrally driven tapping face plate unit which is also clamped to the machine quill.

3—A standard gear case, lig bored and equipped with standard gears, bushings and spinifies arranged to meet the multiple drilling or tapping requirements of the specific job. The gear case can be interchangeably bothed to either face picle. Hence, on short run jobs, the same gear case can be used for both drilling and tapping. Simply change the face plate unit and the chucks.

4-A standard bed plate with guide rods which fit into bushings attached to the gear case. On this bed plate is mounted a work holder, jig or flature specially designed for the requirements of the specific job.

Note that these elements assemble and tie up as a unit like a punch and die. Set-up and take-down of this unit on your drill press is a motter of a few bolts.

The number of spindles depends on the material, number and size of holes and their depth and is determined by Etto engineers from a study of the particular job. Most of the parts can be reused in converting heads for other jobs.

IT WILL PAY YOU WELL to consult Etico on your small parts drilling and topping, because Etico-Emrick Multiple Heads pay their nominal cost over and over again by savings in man-hours and machine-hours. Send a sample or drawing for recommendations and estimates.

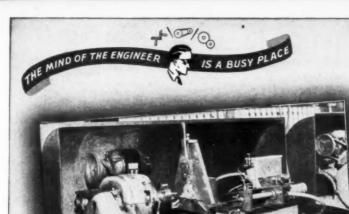


ETTCO TOOL CO.

596 Johnson Ave., Brooklyn 6, N. Y.

Detroit 2 Chicago 6

Over 25 years specialization in solving Industries drilling and tapping problems



"AUTOMATIC" LATHE SPEEDS DRILLING

Western Die Casting Co., Emeryville, Calif., has produced over a million precision bored (.0005) pulleys for B 29s with 3 special equipped Atlas lathes. Operators simply insert work and trip a valve. The complete cycle of feed, bore, and retract is handled by hydraulic valves and pistons,

Keep your postwar production in mind as you look at this installation. Are there operations in your reconversion plan that can be handled by compact Atlas tools equipped with jigs and automatic controls and feeds?

The Atlas 4-Tool Team can be adapted for all kinds of precision production - at low cost. Send for latest catalogs, specifications, and adaptation ideas.

S PRESS CO., 650 N. PITCHER ST., KALAMAZOO, 130, MICH.

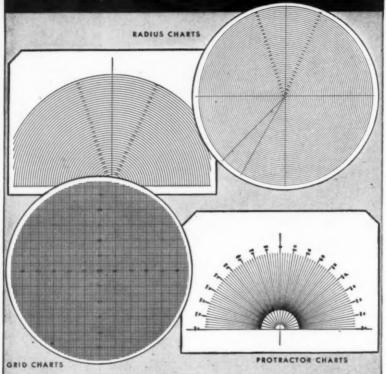








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• Manufactured for use with all types of optical comparators, micro and measuring projectors, Universal Standard Comparator Charts of many kinds are available in all standard magnifications.

Write for booklet, giving complete information.

ENGINEERS SPECIALTIES DIVISION

OM UNIVERSAL ENGRAVING & COLORPLATE COMPANY INC.

980 ELLICOTT STREET TWIN PLANTS CLEVELAND 15 OHIO



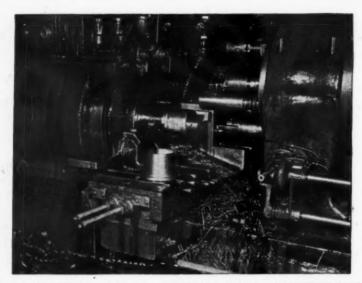
"Get the most out of every tool!"

The increased production obtained with TECO Cemented Carbide is paying extra dividends in today's heavy carbide demands.

TECO Cemented Carbide Tools stay on the job longer, produce more pieces, remain highly productive for the full life of the tool. That's because TECO is extremely hard, tough and uniform—resists wear and breakage to an advanced degree.

PROVE IT YOURSELF! Tool up a machine or two with TECO Cemented Carbide, in place of present carbide tools. Then check your output against previous results. One of our tool engineers will gladly discuss your needs or arrange a test run at your convenience. Send for catalog and price list covering full line of standard tools and blanks.





ONE SETUP ON A CLEVELAND AUTOMATIC DELIVERS THIS PART IN 52100 STEEL

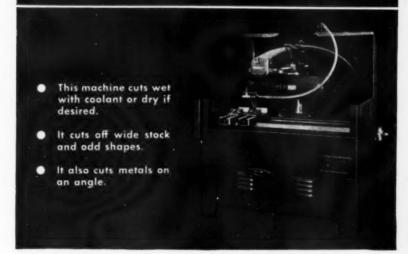
If you ever have to produce parts like this for profit, remember this simple setup on a Cleveland $5\frac{3}{4}$ " Model A. Automatic . . . STOCK; $4\frac{7}{8}$ " bars of 52100 steel . . . TOLERANCES; overall .003 . . . TOOLS; carbide in five turret stations and two cross slide mountings . . . SEQUENCE; 1 . . Gauge stock; 2 . . rough turn two diameters OD and center-drill; 3 . . rough out ID and flat bottom from turret and finish form two ODs from rear cross slide; 4 . . rebore ID and finish flat bottom, start cutoff from front cross slide; 5 . . finish ream, complete cutoff. Part is delivered faster than by any method previously used, machine automatically advances stock and proceeds with next piece. A total of 16.9 lbs. of metal is removed. The $5\frac{3}{4}$ " A is but one of the versatile Cleveland line with capacities from 9/16" to 10". Described in the latest bulletin, available on request.

Just Remember: Clevelands Cut Costs

THE CLEVELAND AUTOMATIC MACHINE CO.

2277 Ashland Road + CLEVELAND 3, OHIO
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DE WALT offers cut-off power to spare!



Power is the keynote of the new DeWalt "Wet-Cut" Heavy-Duty Metal Cutting Machine. Its 15 H.P. DeWalt-built motor, driving an 18" diameter abrasive wheel or steel saw blade, makes it possible to "walk" through the toughest kind of metal. It is this same power that keeps abrasive wheels operating at a constant speed, thus increasing wheel life and accuracy of cut. It is power like this that saves time and lowers cutting cost.

If you have a heavy-duty metal cutting job to do, investigate this DeWalt. Write for full information.

DEWALT PRODUCTS CORPORATION

236 FOUNTAIN AVENUE

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Get the most out of every machine



use GRAY-MILLS portable

COOLANT SYSTEM

to prolong tool life ... improve finish ...



Productive capacity of drill press increased by addition of this Gray-Mills Coolant System. Write for details, today.



DELTA CUT-OFF SAW

Work is speeded up on this Delta cut-off saw by use of Gray-Mills system for supplying coolants. On the lathes pictured above, and on other machines having no built-in coolant system—Gray-Mills Coolant Systems are the simple, effective and economical means of applying coolants or cutting oils. Used on grinders, drill presses, abrasive cut-off machines, lathes, metal cutting band saws, milling machines, etc., Gray-Mills Systems apply coolants in controlled volume, either constantly or intermittently. The increased production, longer tool life and improved finish that result will quickly pay for these easily installed, inexpensive Gray-Mills Coolant Systems.

Available in a variety of models, and with complete pans and fittings, for every requirement. Write for details and prices.

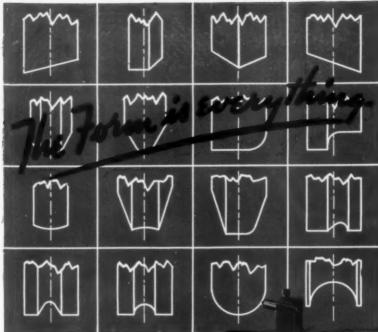
GRAY-MILLS CO., 1945 Ridge Avenue, Evanston, Illinois



Complete Portable

COOLANT SYSTEMS

FRACTIONAL H. P. PUMPS ◆ PARTS CLEANING SYSTEMS INDUSTRIAL FLUID REFRIGERATING SYSTEMS



... and definitely so when applied to grinding-wheel forms. Dressing and repeating that form within an accuracy of .0001"—simple and rapid conversion to other jobs—eliminating time-wasting adjustments on the diamond post—these are items that can loom large in production costs. Reducing these costs and improving the form dressing is the prime object of the VINCO 8-1 DRESSER (angle tangent to radius). Precision built—reliable year-in and year-out, and adaptable to nearly every type of grinder. Write for more detailed information.



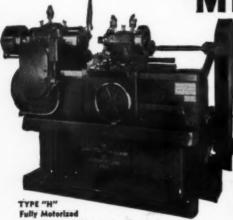
MILLIONTHS OF AN INCH FOR SALE BY VINCO

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Semi-Automatic Hydraulic Spline and Geor Grinder - Optical Moster Inspection Dividing Head + Involute Checker + Angle Tangent to Radius Dresser + Index Plates - Practicin Vises + Sine Bate + Straight-raide Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gege + Thread Plugs, Rings and Setting Plug Geges + Special Geges + Thread Radius Plugs - George + Propeller Hub Geges + Built up and Special Geges + George Radius Enteres + Spline and Index Elstures - Hydraulis Power Control Utilization and Distribution Utilits + Gegestering Design and Development

If You can
CHUCK it
You can
THREAD it on .

COULTER HOB THREAD MILLER



THE RAPID
DUPLICATION
OF RIGHT OR
LEFT HAND
THREADS
INTERNAL
OF

Hob thread work can be handled with high speed and precision on this rigid, simple, fully motorized machine. The range of work it is capable of handling is practically unlimited. Any parts that may be held in ordinary chucks, air operated chucks, or special face plate fixtures can be threaded advantageously. Design of the machine permits accommodation of long work.

Work and cutter spindles are driven by individual motors. A wide range of speeds and feeds is available for threading parts of various materials. Maximum external thread capacity is 7"; minimum hole depends on smallest hob practical.

It will pay you to investigate the profit possibilities of Coulter equipment by writing for further information.

The James COULTER Machine Co. BRIDGEPORT . CONNECTICUT . U.S.A.

Headquarters FOR SPECIAL NEEDS FOR SPECIAL NEEDS

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with One Tool

Here, for example, is a special combinate Machine Tap designed by MURCHEV to meet a particular and highly specialized requirement. Taps 5-9/16" on front and rear rate housing. This machine has been in operation for 23 years and has been equipped with MURCHEY Taps over the complete period of time. The Taps being employed are special and are used on a double end Barnes machine. A forward boring head is mounted on the Tap so that rough boring, reaming and threading is done with one tool. Let us work with you on your requirements.

MURCHEY MACHINE & TOOL CO.

Photographs by courtesy of The Timken Detroit Axle Co.

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MURCHEY

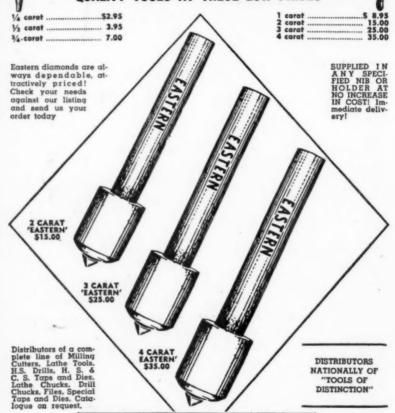
Murchop menufactures all Spper of Collapsible Taps, Solf Opening Die Hauds, Thread Milling Machines and Shell Tapping Machines. Write for Catalogues, Address Daps, M.

MURCHEY



Top Values in **DIAMONDS**

QUALITY TOOLS AT THESE LOW PRICES



EASTERN TOOL AND SUPPLY CO.

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For Precision Grinding and Sharpening



ROTOREX UNIVERSAL GRINDER

TOOL ROOM . MODEL SHOP . PRODUCTION

8" x 15" capacity. Variable spindle speeds ranging from 3000 to 6000 R.P.M., making the machine flexible and particularly suitable for delicate grinding jobs. Readily interchangeable attachments for single purpose jobs such as cylindrical, internal, and radius grinding, makes the Rotorex Grinder a universal machine for all kinds of grinding and sharpening operations.

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PROMPT DELIVERY



THE U.S. for Accurate and Automatic **Punch Press Feeding**

On the majority of punch press jobs the use of cell stack has resulted in vastly improved operations. One of the main contributing factors is that cell stock permits the use of an automatic feeding mechanism such as the U. S. Slide Feed.

The U. S. Slide Feed is mounted directly on the belster plate of the press and the drive is taken from the press crankshaft. This type of set-up converts the press into an automatic machine, in addition, controlled accuracy of feed length is maintained—the feed block reciprocating between definite (adjustable) stops limits the pitch to the amount required. The initial setting for feed length is obtained by means of an eccentric mounted on the extension of the press crankshaft.

The usual method of mounting the U. S. Slide Feeds is on the left hand side of the press for feeding the material from left to right. The illustration below shows the arrangement.

The photograph shows a No. SF-11 U. S. Slide Feed (capacity 2'';" wide x 6" feed length), U. S. Seven Roll Plain Straightener, and CR-2 Centralizing Type Stock Reel mounted for use with a Minster Open Back Inclinable Press.

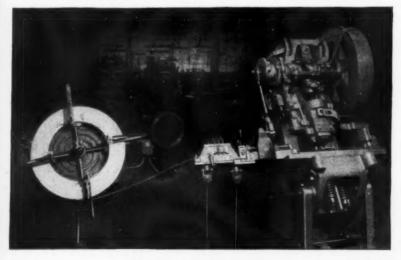
Special connections can in many cases be provided for feeding from front to back, back to front, or right to left.

Another feature of the U. S. Slide Feeds is their ability to pull the material through a plain stock straightener. This makes the ideal set-up for the removal of soil set.

Both the U. S. Slide Feeds and U. S. Plain Straighteners are made in a range of alzes to provide for various widths of material and feed lengths. Builetin No. 50H contains complete specifications and descriptions of the U. S. Slide Feeds, Straighteners, Steck Reels, Ceil Cradles, and Steck Oliers. Ask for your copy.



Builders of U. S. Multi Millers U. S. Multi Slides U. S. Automatic Press Room Equipment U. S. Die Sets and Accessories





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A MACHINE IS AS GOOD AS ITS CUTTING TOOL...

Specify CONTINENTAL

The precision cutting tool must be even more occurate than the meckine, the fixture, or the finished part. "Centinental" cutting tools made by Ex-Cell-O (they run from a standard counterbore to all types of breaches and to special carbide-tipped tools of intricate design) are acknowledged to be among the best obtainable in design and manufacture and in actual production results.

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Easy

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EASE OF OPERATION: With the "EASY" Sander even the most inexperienced workers turn out more and better work than two or three hand operators. Sanding, rubbing, polishing, scuffing, "featheredging", de-burring—wood, metal, plastic, alloy die stock, surfacer material, etc.



FILLER (PLASTER) COAT: The "EASY" produces a smooth, flat surface without abrasive marks or gouges.



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For absolute accuracy in gauging points when laying out drill jigs, dies and fixtures. Accuracy to .0001 inch. Made of hard-edge grain, non-warping granite, ground and lapped to precise tolerances. Smooth, free action surface. Will not change shape or accuracy with variations in temperature or with age; not affected by scratches or burrs. Rust proof—corrosion proof—readily cleaned. Sizes up to 30° x 72°. Larger sizes available.

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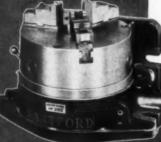


Other Machine Tool Accessories include: Dust Collectors, Live Centers, Lathe Chucks, Demagnetizers, Grinding Wheel Dressers, Balancing Ways,

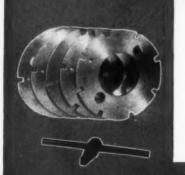
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Super Spacer



THE CLIMATE IN CONTROL

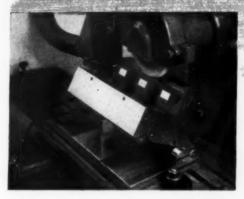


This versatile device is readily adaptable for milling, drilling, grinding, jib boring and slotting at feeds and speeds limited only by capacity of the holding means and power of the machine. It is a tried and proven tool of exceptional value in accurate indexing operations,

Descriptive circular sent on request

THE HARTFORD Special Machinery Co.

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You can save time and money in many ways with The MAGNA-SINE on short runs involving just a few parts. First, any angular set-up for grinding or other light machining operations can be made on The MAGNA-SINE in a very small fraction of the time required for conventional set-up methods. This time saving alone is enough to make The MAGNA-SINE an extremely valuable shop tool.

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It will surprise you to learn how much the Turchan will save you in equipment cost and production time on war and postwar products. Send sample or blueprint of parts for Turchan production estimate.



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Hydraulic Follower Machine

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By Dial Indicator Readings at Production, You Are Able to **Determine WHEN Dimensions** are Going "Out-of-Control"

FEDERAL Dial Indicator Gages visualize the progressive change, during production, in the dimension of the workpiece toward the Out-of-Control danger Zones. Thus you are forewarned when machine adjustments are about to become necessary.

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A MODERN PUMP FOR MODERN MACHINE TOOLS







With structure all its own, brass is a difficult metal to file. While softer and more malleable than steel, brass is tough and ductile. These characteristics demand file teeth that are sturdy, very sharp, and cut at an angle that prevents "grooving" and running the file off the work. Still more important, the file must not clog.

The Nicholson Special Purpose File for Brass is designed to meet both these requirements: The short upcut angle helps to keep the file "on course"; and the fine, long-angle overcut produces small scallops which break up the filings and enable the file to clear itself of chips.

For fast, efficient results, and for keeping file in good cutting condition, workmen should be cautioned against the use of regular Flat (double cut) or Mill (single cut) files which have a tendency to fill up when working on brass.

"FILE FILOSOPHY," the interesting, illustrated 48-page book on file kinds, use and care, will prove helpful to foremen and production heads in instructing mechanics on the use of The right file for the job. Free.

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It is reported that

A new aluminum alloy, R-303, is claimed to be non-corrosive and to have twice the compressive strength of structural steel. Reynolde Metals Co.

get ready with GUNE for tomorrow

A method has been announced for transmitting television programs over-ordinary telephone lines, instead of coaxial cables or air relays, and for the recording of television in a manner comparable to the recording of radio. Packard Mfg. Co.

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The fuel being used in the B-29's over Japan is said to have an octane rating well over 130. Aero Digest.

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This year's models of one make of highway bus have rubber springs. Twin Coach.

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A newly installed turbine generator, in a city power station, has twice the capacity of the 14 previously installed units combined. Fisk Station, Chicago.

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One of our new aircraft engines weighs only 0.97 pounds per horse power. Wright Cyclone 9.

get ready with CIINE for tamorrem

The first American-built steam turbine locomotive is being given a service test. Baldwin Locomotive Works, Penna, R. R.

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Army aircraft are being "jacked up" when on soft ground by inflating large rubber pillows placed under the wings. Science News Letter.

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A manufacturer of aluminum utensils is planning to make aluminum kitchen furniture. Aluminum Cooking Utensils Company. White or light colored vitreous enamels can now be applied directly to steel surfaces. Inland Steel Company.

get ready with CONE for tomorrow

A company has been established to process three-dimensional photographs (vectographs) in quantity for civilians. Three Dimension Company.

art ready with CHNE for temorros

Anew processed wood called "Staypak" has been developed that is claimed to be twice as tough as "Compreg". U. S. Forest Products Lab., Madison, Wisconsin.

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In one city a system of radiotelephone communications between a central station and public or private vehicles is expected to be in operation by next fall. Pittaburgh. An airport bus, designed to connect small towns with main airlines, has a ticket office, flight control tower, freight space, lunch counter, twoway radio, telephone and washroom, as well as seating space for passengers. Parks Air Transport East St. Louis.

get ready with CONE for tameream

Reports say that one of our largest automobile manufacturers is planning an entirely new 5-cylinder car to sell at about 20% below the lowest prewar level. Ford.

set reads with GUNE for tembercow

A new process so reduces the cost of making gasoline from natural gas that a large refinery is being planned for this purpose. M. W. Kellog, Jersey City.

get ready with GUNE for tomorrow

30 to 50 ton trucks as long as 75 feet have been built and are now being put to specialised uses, such as the hauling of ore, aircraft and prefabricated houses. Scientific American.



VELVET-SMOOTH CONTROL

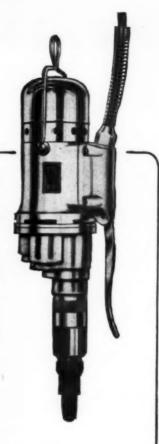
No. 50 easily handles many jobs previously considered too delicate for a power driver. The patented, new principle "Adjustomatic" clutch delivers any desired torque. Adjustability is so sensitive that screws from No. 10 down to No. 2 and smaller, may be driven with a surprising uniformity that eliminates breakage and marring of surfaces. Instant, effortless control assures quick, positive positioning and minimum fatigue.

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Nowadays, with a shortage of skilled manpower, power-driven tools must take up the slack. To do this, with no "time out" for mechanical stoppages, they must be unfailingly dependable — like this Millers Falls No. 50 Electric Screw Driver.

Many exclusive refinements, combined with the sturdy power unit and precision transmission, make No. 50 the most versatile, dependable electric driver ever built—a consistent top-notch performer for speedy, accurate mass fastening.

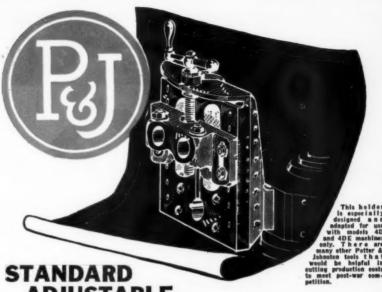
You can step up manpower effectiveness, and cut production time and costs with Millers Falls No. 50 It is a worthy member of a complete line of electric tools. See your distributor, or let us survey your assemblies and make recommendations.



MILLERS FALLS
TOOLS

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ADJUSTABLE
TURNING TOOL HOLDER

This adjustable tool holder will carry two Stems, either for turning or boring cuts, and in addition, a boring bar or drill may be carried in the center hole. The cutters are quickly set to the required diameters by moving the adjustable block up or down. The side scale and the micrometer dial under the ball crank contribute to quick and accurate settings which may be changed easily with the job. Two locking screws on either side of the block fix it solidly in the location desired. The adjustment range of the Stem holes is from 4 to 10" from the rotation center.

If you use Potter & Johnston machines in your plant, it will pay you to let us send you a copy of this catalog on modern tooling. It illustrates and describes a broad range of up-to-the-minute production tools.



The POTTER & JOHNSTON MACHINE CO. PAWTUCKET

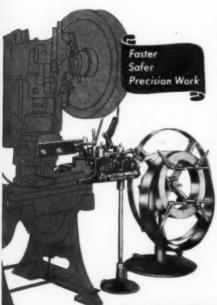
RHODE ISLAND

Planning Peacetime Production Using Coiled Strip Stock?

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Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

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Automatic
ROLL FEEDS
AND
REEL STANDS

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VARD INC. introduces "Gage Engineering." This Quality Control consultation service provides the specification for gaging of each step in the manufacture and assembly of your finished product.

VARD's trained gage engineers can help you plan a thorough inspection program that will produce more better and faster. Call your VARD representative for complete information on "Gage Engineering."



VARD INC.
PASADENA B, CALIF.



ACCURATE REPEATING of length in bar stock work is assured by the Newton Bar Feed. Rejects are reduced; production stepped up.

Your airline connects to the pressure Regulator which delivers the desired pressure to the far end of the stock tube and actuates the Piston which pushes the stock into the lathe and against the stop under uniform pressure. Thus, length rejections caused by the variations of pressure inherent in mechanical and hand-feeding of stock are eliminated.

Noiseless steck feeding is accomplished by the Newton Bar Feed. The forward end of the Piston, mounted on end-thrust ballbearings and of inverted cone shape, centers the stock and turns with it, thereby holding it away from the feeder tube.

Piston rings of carbon-impregnated Neoprene rabber seldom require renewal in order to retain satisfactory air pressure in the feeder tube. Replacement cost is very low.

Stock loading is facilitated by the Newton Bar Feed. It is only necessary for the operator, without turning away from the lathe, to release the tube lock by a turn of the hand knob, swing the tube over on the slide bracket, insert the bar stock, return the tube to position and lock it.

Pressure regulator in full sight of the operator at all times, is quickly adjusted for warious stock weights. Only a small amount of line pressure is necessary for stock feed. For example: 4 lbs. pressure feeds ¼" diameter x 8 ft. stock.

Made in 6 sizes to accommodate bar lengths from 6 ft. to 12 ft., the Newton Bar Feed is priced from

\$59.50 to \$71.50

Price includes Pressure Regulator, Stands, Piston. Everything is complete, ready for use.

Newton HOLE CUTTER

Cuts anything cutable-metal, wood, plastic. Furnished with hardened dowel for lead, which may be replaced with a center drifl; also, a ground cutter. Your



choice of a Morse Taper No. 2, ½" or ¾'s shank. Adjustable arm with milled keyway assures adjustment without slip page. No. 1 Newton Hole Cutter, 1" to 6" capacity, \$5.00. No. 2 Hole Cutter 1½" to 8" capacity, \$10.00

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One operator easily handles three Newton Automat-equipped lathes. Labor cost is cut two-thirds. Social Security payments are cut two-thirds. Your manpower headaches will be eased.

Small run jobs can be taken at a profit. Set-up time is the same as for hand-operated turret lathes; production compares with that of costly automatics; hourly machine investment charge is the same as for your present machines as the first job or two pays completely for a Newton Automat installation. Write today for Bulletin.



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PLUG GAGE

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Sizes .240" to 1.510"

(6mm. to 38mm.)

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Sixes 1,510 to 6,010

(38mm. to 152mm.)

Color Signals

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EASY TO USE . TELLS MORE

Spherical shape, chamfering and relief make entrance easy, gaging positive.

Color signals prevent confusion, fumbling, wasted motions, faulty readings.

Chamfer edge helps clean bore and prepares clean surface for accurate gaging.

Finger-tip feel and control reveal true internal conditions at any point in bore.

Reveals out - of - roundness, taper, belling, and dimensional deviations by tilt of handle.

May be used in deep bores and close to bottom of blind bores.

Newest Development in Simple, Precise Bore Gaging

Again STANDARD pioneers with DuBo, newest, most satisfactory bore checking gage of the fixed limit type. Gives to bore gaging new, effortless, finger-tip control, assures precision and speed far beyond the scope of ordinary plug gages . . . whether used by skilled or unskilled workers. Vivid color bands unmistakably identify go and not go members; unusual lightness and balance minimize fatigue and errors; simple manipulation makes DuBo ideal for use at bench or machine.

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BLUE BOOK

Presents . .

SHEARING by William C. Tucker is a review of the progress which has been made in that art. Shears and the methods of shearing metal have improved over the years so that today we have a very diverse line of machines and tools for such purposes. Mr. Tucker will welcome any questions bearing on the subject. See page

"LET'S TALK SHOP", page.....291

WHAT'S NEW, page......312

MECHANICS THRU THE AGES, page410



HAPING FILLETS on metal parts or patterns—getting in behind overhanging lugs or projections—deburring or countersinking holes in hard-to-get-at places (like the inside of a tube) . . . these indicate the versatility of the Nicholson Ball Shape Rotary File operated by portable tool or flexible shaft.

The Ball is one of 16 shapes Nicholson regards as standard for covering all practical machine-shop applications of rotary files.

Each shape is offered in either Hand Cut or Ground type. The former, when no longer serviceable as such, can be converted into Ground type. The latter can be resharpened—usually a number of times—at slight loss of diameter.

WRITE FOR CATALOG AND PRICE LIST — and for any help desired in the selection of *The right file for the job*. For ordering, contact your mill-supply house.

NICHOLSON FILE COMPANY, 34 Acorn St., Providence 1, R. I.
(In Canada, Port Hope, Ont.)

6 STANDARD

(in either Hand Cut or Ground). 3 cuts — Coarse, Medium, Fine. Diameters 1/2 to 11/4.



Hand Cut Ground

NICHOLSON ROTARY FILES

HAND CUT AND GROUND-FOR EVERY PURPOSE





EDITOR



66 F OR war we build machine tools to make engines of destruction. For peace we must build machine tools to make the ma-chines of production."

"For war we had, to all intents and purposes, one customer — Uncle Sam. For peace we shall be competing with each other for the business of thousands of customers. "For war the major consideration was speed of production. For the major consideration, peace, will be cost of production.

"For war the big worry was how could we employ enough men to do the work. For peace the big worry will be getting enough work

to employ all the men.'

These various phases of the reversal of thinking and planning necessary for the post-war period were emphasized at a recent meeting of the National Machine Tool Builders Ass'n by President Joseph Trecker.

Nobody knows how long it will be until V-J Day. Obviously during the interim our prime duty is to supply all the needs of our fight-

ing men.

Much depends upon our ever-increasing air power. The Japs may capitulate sooner than we expect or the struggle may outlast some of the pessimistic predictions.

Wherever possible, post-war plan-ning should consider both contingencies. If the time is short, at least some preparations can be made. If Victory is deferred, re-conversion plans may be further advanced. In either event, the planning should strive for a minimum amount of employment dislocation. The time element depends largely upon deliveries of critical machine tools. In turn this rests largely upon the priorities, material and personnel made available for the machine tool bulders.

One fact is manifest-the vital role of machine tools in arming and safeguarding the nation.

With the more potent modern engines of destruction, we can never relax again and permit ourselves to be caught with inadequate defenses. That means we must have striking power second to none and sufficient standby machine tool equipment to maintain all our safeguards.

As Mr. Trecker pointed out, the machine tools built for war were the finest the world has ever seen. They represent a tremendous na-tional asset and should be used for the benefit of the nation as a whole.

It would make sense for American manufacturers to throw out of their plants and onto the scrap yards, all of their 15 and 20-year old machine tools, replacing these with new tools or tools available from war surpluses. The old tools simply are not good enough to meet the hectic post-war competi-

Wesley G. Paulson

FLYING MACHINE SHOPS BACK UP THE B-29S







Interior views of a Commando Flying Machine Shop of the XX Bomber Command equipped with a South Bund Laths.

Official U. S. Army Photos.

Flying machine shops are playing a vital behind-the-scenes role in the operation of the B-29 "Superfortresses" now carrying on the air offensive against Japan.

With ordinary repair facilities, it takes days or even weeks to repair bombers grounded away from their bases—often they have to be abandoned. Now Curtiss Commandos fly machine shop facilities to these planes, enabling them to quickly return to their bombing mis-

sions. These flying machine shops, through the diversity of their metal working equipment, are performing every type of repair work except the complete rebuilding of engines and planes.

The unprecedented job being done by these flying machine shops is bolstering our striking power where it is needed the most. As an important part of this equipment, South Bend Lathes are contributing their dependability, accuracy, and versatility.

Write for new Catalog 100-D which illustrates all South Bend Lathes in full color.



SOUTH BEND LATHE WORKS

426 E. MADISON ST., SOUTH BEND 22, INDIANA . LATHE BUILDERS FOR 38 YEARS



How Ryerson Assures Alloy Steel Quality

Each alloy shipment is personally inspected and tagged as a part of a rigid quality control system, which we call the Ryerson Certified Steel Plan. This plan covers: selection of individual heats of steel, testing of samples from each heat, positive identification of every alloy bar with stamped heat symbol and painted color marking (or a metal tag), and an Alloy Steel Report sent with each shipment.

This report shows complete test information for the particular heat of steel shipped. It contains: chemical analysis, recommended working temperatures, Jominy test results, and an interpretation of physical properties for 1, 2, 3 and 4 inch rounds, quenched and drawn at 1000°, 1100° and 1200° F. The report serves as positive identification, a check on quality and as a guide to satisfactory heat treatment.

The Ryerson Inspection Tag is the final culmination of our quality controls. It places a personal responsibility on us for the fulfillment of every specification in your order. Call Ryerson for alloys or for any other steel, and he assured of uniform quality and prompt action.

RYERSON STEEL

Joseph T. Ryerson & Son, Inc., Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, Buffalo, New York, Boston.



By WM. C. TUCKER*

N the field of cutting metal, considerable progress has been made during the last two decades. Many methods and processes are now employed. Perhaps the oldest, however, is still the one most widely used, viz., shearing.

There are three references to shears in the Old Testament of the Bible. The Egyptians used metal shears as early as 800 B.C. However, the Romans apparently made the first two bladed shears.

Shears and the methods of shearing metal have improved over the years so that today we have a very diverse line of machines and tools that shear metal. Althothese improvements are many, the principles of shearing remain unchanged.

Primarily, the mechanics of shearing can be described as two equal opposing forces concentrated within two immediately adjacent planes, becoming increas-

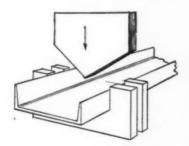


FIG.1 PARTING SHEAR, KNIFE ARRANGEMENT



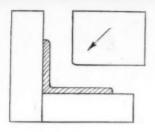
FIG. 2 SPLITTING SHEAR KNIVES

ingly effective beyond the yield point of the material so stressed. When the yield point of the material has been exceeded, a fracture of the material fibre occurs between the two parallel planes of the opposing forces.

The opposing forces are concentrated upon the material thru the agency of hardened steel knives, the effective edges of the opposing knives being the ones nearest to each other. These cutting edges while contacting the material during the period of increasing pressure or strain, penetrate and sever the surface fibres, also, thereby defining the plane of fracture thru the body of the material.

Such metal working operations as punching, blanking, trimming, slitting and parting all belong to the shearing group.

*Ass't. Chief Engineer, Machine Tool Division, Buffalo Forge Co., Buffalo, N. Y.



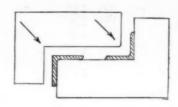


Fig. 3 Angle Shear Knife Arrangements

It is, however, the purpose of this article to confine itself primarily to the process of straight shearing.

Straight shearing alone presents a very broad field for discussion. Such a discussion should, of necessity, from the standpoint of interest, remain mostly descriptive rather than become too technical.

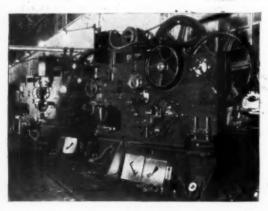
Power operated metal shears, broadly speaking, can all be classified under oneor another of the types shown in this list:

Bloom shears, Slab Shears, Billet Shears, Plate Shears, Sheet Shears, Flying Shears, Beam Shears, Angle Shears, Bar Shears, Scrap Shears, Alligator Shears, Rotary Shears, Slitting Shears, Squaring Shears: Practically all of the shears listed can be found in a steel mill. The whole metal working industry in a large way depends upon shears of some type for its production.

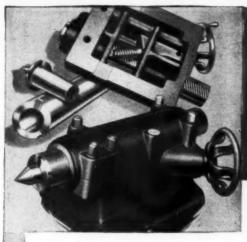
The largest shears are generally to be found in the steel mills. These include the bloom, slab, billet and plate shears. They are powered by electric motor drives, or hydraulically operated and in some instances are steam driven.

Slab shears are made in both the upcut or the up-and-down cut variety. Mill slabs are sheared in thickness of 20" and over, and in widths 54" and over. These figures are cited only as examples and do not represent present day limits.

Plate shears have also grown up and now one finds shears that will, cut 2"



These are combination type shears on the assembly line. In the foreground will be noticed some typical extra knives for the profile shearing of channels.



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thick armor plate 144" wide. Even this capacity can be increased. Billet shear capacities have been on the up-grade for some time. Billets of 65,000 lbs tensile strength steel are being sheared cold up to and including 9" squares or 10" rounds. More will be said concerning billet shear capacities later.

All of the types of shears mentioned, with the exception of the alligator, rotary and slitting shears, can and usually are made with the guillotine styles of frames or with closed frame styles. In both of these frame types, the material being sheared must pass into the knives in a line passing thru an opening in the closed type frames, or between the two side frames of the guillotine type shears.

Most of these shears also can be made in the open frame or C-type frame construction, within certain limitations. In many instances open or C-type frame shears are used with interchangeable shearing tools for various classes of shearing, such as for angles, bars, billets, beams and plate slitting.

Altho the open frame type shears have certain advantages, it is obvious that the closed or guillotine double housing types have greater strength and less deflection than the open or C-type frames. On a comparative basis for strength, the C-type frames must be much larger and heavier, capacity for capacity.

The advantages of the C-frames are:-



Rear view of modern billet shear. The accumulation of 4x4" slugs was cut within 7 minutes—a total of 56 pieces 4½" long.

(1) the ease of changing knives or complete tools; (2) the ability to insert material into the knives from the point of the machine without the necessity of passing long material thru the knives before making a cut; and (3) a full view

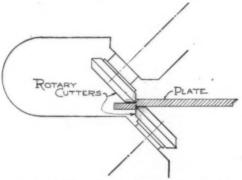


FIG. 4 PRINCIPLE OF ROTARY SHEAR



possible only with this machine - transmits mathematical precision to the work.

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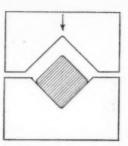
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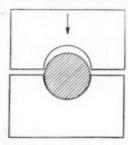
directly to the workpiece.

DIRECT . . . mills intricate shapes in a single setup without the aid of templets or models transmitting blueprint dimensions and outlines

ACCURATE . . . chances for error are eliminated because there is no change in setup. Exact control of all combinations of cutting movements—

FIG. 5
BILLET SHEAR
KNIVES FOR
SQUARES
AND ROUNDS





may be had of the work on both sides of the shear knives.

A flying shear is generally used on sheet or strip material and has its operating mechanism synchronized with the



Here is a shearing tool for tees,

movement of the material passing continuously thru its knives. In other words, the shear makes its cut without stopping the movement of the material. In most instances the speed of the material movement is quite rapid and the action of the shear is flash-like in operation.

Sheet shears in addition to being most frequently made in the guillotine or double housing vertical slide types, are sometimes found to have the knives mounted on rolls that are a little longer than the width of the sheets. These rolls revolve when a cut is to be made, bring-

ing the shearing knives thru the shearing cycle.

Beam shears, as their name implies, are designed for the purpose of shearing to length, I-beams, channels and other rolled sections. There are two generally accepted methods of knife design and operation for section shearing.

The first makes use of knives which have openings within them corresponding to the profile of the section. The direction of movement of the movable knife is at an angle of 45° to the long axis of the section within the opening of the stationary knife. Altho satisfactory cuts are obtainable by this method with properly designed knives, the sheared end of the stationary piece and the sheared end of the drop-off piece are seldom identical in quality. The second method employs two lower or stationary knives, parallel to each other and separated by an amount equal to the thickness, plus a small clearance of the upper or movable knife. The

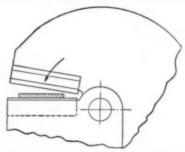


FIG. 6 PRINCIPLE OF ALLIGATOR SHEAR

more than ever before



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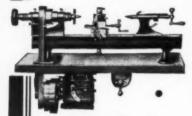






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lower knives have a conformity with three sides of the section which is to be sheared, whereas the top knife is shaped like a wedge. (See Fig. 1)

In operation, the top knife descends upon the section which is to be sheared while it lies within the lower knives. The point of the wedge shaped knife pierces the center of the web of the section and as it continues to descend, the sides of the wedge shear cut a strip, right and left of the remaining web as well as the flanges of the section. The upper knife passes beween the two lower knives and virtually shears or punches out a strip separating cleanly the two parts of the section.

Usually this is a very square cut and is identical in quality on both of the sheared ends of the material. The disadvantages of this type of shearing are the necessity of a relatively long stroke machine and a waste of material thru scrap of the sheared cut strip.

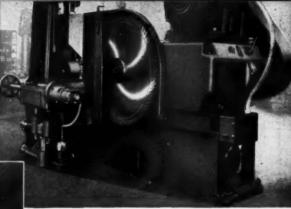


Modern welded steel mill-type shear for precision cutting of channels and other rolled steel shapes.

Angle shears are usually made with two shear openings in the frames, so that knife arrangements can be made for both right and left hand mitre cuts. Angle shears are built with capacities up to and



Alternate high (roughing) and low (finishing) teeth produce single and double curling chips, respectively,



Motch & Merryweather Cold Sawing Machine, equipped with nine speeds, goes through 17" billet of non-ferrous metal in record time, using Triple-Chip Blade. Note rugged construction, ready accessibility for blade changing.

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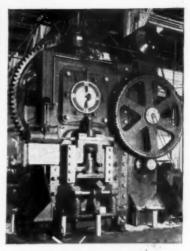
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Billet shear for cold shearing 9" squares or 10" diameter rounds. This machine has air operated controls.

including 8x8x11/8" angles. This is the heaviest and largest angle rolled at present.

Bar shears are made in a great variety of designs and sizes. They are used in rolling mills, cold-drawn mills, merchant mills, warehouses and many other industries. Present-day production demands are making it necessary for shears of this class to run at higher rates of speed. In instances where they are used in rolling mills and drawing mills, it is desirable to have the shears operate at speeds in keeping with the rolling or drawing speed of the bars. It is also a well known and proven fact that faster knife action improves the squareness of the cut. Many of these shears are used at speeds of 100 strokes per minute.

Scrap shears are not exactly specialized types of shears and, therefore, usually are almost any old shear of the C-frame or alligator types with cross-cut shear knives. Alligator shears are generally the ones used for scrap shears, in which cases they may have either long or short knives according to the kind of scrap being sheared.

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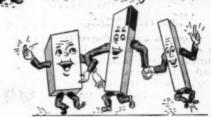
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Adjustable Tool Helder



presses me so hard at point breaking in two

length grip of Clark Adjustable Tool Holder really holds without creaking my back.



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CARBIE CARBIDE

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SIZE

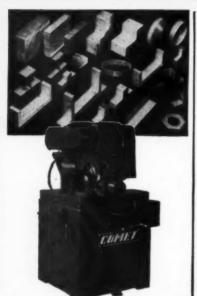
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|----------------|------|---------------|--|--|
| MODEL | SIZE | TOOL CAPACITY | | |
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| 61 | 9 | 3/16 to 3/8 | | |
| 62 | 2 | 1/4 to 1/2 | | |
| 64 | 4 | 5/16 to 5/8 | | |

aither left or right hand

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AUTOMATIC CUT-OFF MACHINE

An alligator shear derives its name from the fact that its appearance resembles the head and jaws of an alligator as well as its jaw action.

Rotary shears, as the name signifies, are used for shearing circles from sheets and plates. The frames are always of the C-type and the knives or cutters are also circular and are revolved by power-driven gears. There is no up-and-down knife movement in this type of shear.

A serpentine shear is similar in construction and action to a rotary shear with a few differences in the shape and position of the rotary knives. It is used for making irregular curved cuts. It is usually a throatless type, permitting the use of material of almost unlimited length.

Slitting shears use straight knives. The top knife is set at such angle in relation to the horizontal lower knife, that in its uppermost position, the lower end forms a closed angle. When the upper knife has moved all the way down in the course of its full stroke, the high end should re-



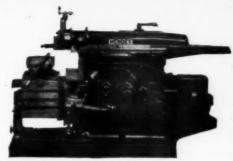
Mill-type round bar shear with automatic air operated hold-down and non-repeat attachment,

main open by an amount equal to slightly more than the maximum thickness

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46"

Size of Table Top Horizontal Travel of Table Vertical Travel of Table

Power Cross Feed Range Net Wt. with motor, approximate 14" x 20"

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.005" to .120"



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Universal Table may be furnished, with 360 degree rotation, together with tilting top which will elevate to 15 degrees either side of harizontal.

When supplied with motor drive, the motor for this shaper will be 5 H.P., constant speed, non-reversing, minimum speed of 1200 and maximum speed of 1800 RPM.

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of plate for which the shear is rated. (See Fig. 2).



The author is standing in front of a milltype slab shear giving some idea of the size of this sturdy machine.

Squaring shears are of the doublehousing or guillotine type and are used primarily for squaring the edges of sheets and plates. They must be of very rigid construction, securely reenforced against deflection to insure accuracy in the squareness of the cut. The gauge used on this type of shear must also be of extra accurate and stable construction. This is also true of the hold-down which must hold the work immovable during the shearing cycle. Either spring or hydraulic hold-down actuated fingers clamp down the work on all good squaring shears. Squaring shears are made with cast frames as well as welded steel frames.

Laid-steel knives are frequently used on squaring shears. These knives comprise a hardened tool steel cutting stripelectrically welded to a backing or body of untempered steel. Long narrow knives of this construction are longer-lived than solid tool steel tempered knives, and are lower in original cost.

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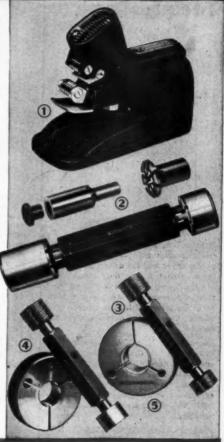
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Each material has widely varying characteristics which must be carefully considered in determining the proper shearing essentials. For instance, it is a wellknown fact that the more ductile materials possess a greater tendency towards deformation and reduction of area than do the harder materials. Proper compensation in shear design is, therefore, necessary to provide good shearing of these materials and to minimize or completely circumvent these undesirable conditions. On the other hand, while hard materials, due to their denser crystalline structure, yield cleaner cuts, they present other difficult problems of a varying nature. These problems affect and determine the design of the entire shearing machine.



Special large diameter punch with floating head.

When shearing rolled shapes, careful consideration must be given to the profile of the section so that knives are used that will not distort or deform the ends of the sheared pieces. Proper timing of the knife edge movement is highly important in this respect. Due attention also must be given to the difference in thickness of the component parts of each section. Compensated penetration of knives for shapes must not be ignored if square and undistorted cuts are desired.



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The point of greatest economy to the shear user in the matter of shear knives is that, while knives must possess all these other qualifications, they must be designed so that regrinding can be accomplished quickly, easily and in such a manner as not to detract in the least from any of the other qualifications. Too often it is the case that some knives begin to lose their accuracy and non-distortion effectiveness with the first regrind. The knife must be so designed that maintenance of its accuracy and effectiveness is not left to the mercy or judgement of an inexperienced grinder.



Triple punching attachment, gag and floating head with built-in notcher.

Proceeding to the next important step, in obtaining good shearing one must choose a machine in which the proper knife for the job is mounted and motivated in the correct manner. The enormous pressures required in the shearing of high tensile hard materials require built-in stamina and effectiveness to withstand usage indefinitely. This naturally should be a prime factor considering the investment values of such equipment.

To obtain the best shearing results, good knife design must be supplemented with





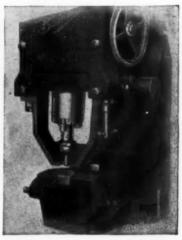
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a powerful hold-down of the adjustable type. The hold-down must grip the material securely thruout the shearing operation. It must work freely and should preferably be automatic in operation. There is a patented type of automatic hold-down now on the market for billet shears that is invaluable for quick continuous shearing of billet stock into short pieces for forging work.



Punch with low die block showing corrugated die for flange punching.

Billet shearing for drop forgings is very exacting inasmuch as it demands square cuts and unvarying lengths for exact duplication without material loss in the filling of the forging dies. Accuracy in the gauging and the hold-down is of prime importance here. Work of this nature also requires a shear with suitable provisions for adjusting knife clearances to overcome the occurrence of short. hair line surface fractures on the sheared faces of the material. These fractures are very detrimental to good forging work. Proper knife clearance is very helpful in eliminating this difficulty. However, in some instances of hard high tensile materials, it has been found that shearing the material at a heat of 300 to 400° F, in

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in any location to the center of 42°, on sheets up to No. 12 gauge.

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addition to the required knife clearance, will prevent surface fractures.

Materials subject to "sag" under pressure of the moving knife require a shear equipped with a properly synchronized supporting pressure pad. When this device is employed in conjunction with multiple bar shearing, its value to the user is incalculable. The same is true of the many well developed features now available on modern shearing equipment.



Punching arrangement for webs of standard beams.

Due to the many unusual demands in the field of metal shearing today, the shear user must consider and analyze carefully his special problem. Then for economy's sake, it should be presented to a qualified shearing engineer for proper treatment and equipment recommendations. The art of good shearing has become a specialized science, as much as any other branch of metal working that has registered improvements and advancement in its particular field.

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You'll get lower production costs, too, because of more accurate reaming, more reamed holes per grind.

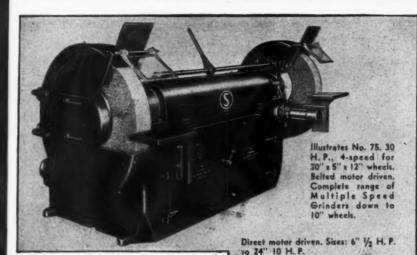
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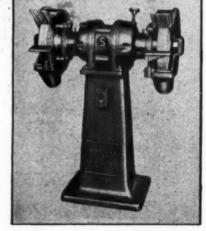


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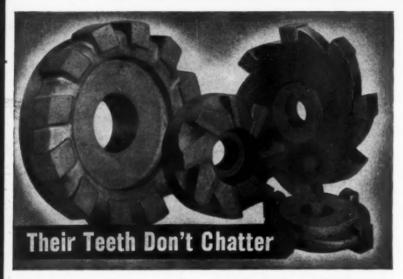


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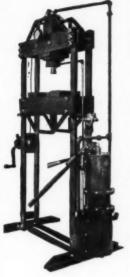
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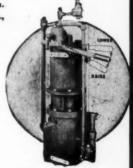
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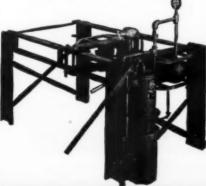
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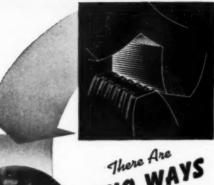
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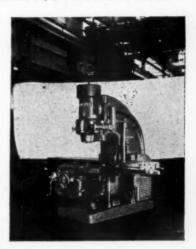
PART VII - CONVERTING TO CARBIDE TOOLING

(Engineering Data, Courtesy Technical Dept., Wesson Tool Co. Detroit.)

F IGURES 1 and 2 represent specially designed milling machines of the Knee Type for carbide steel milling. It will be noted that both the vertical and horizontal models have fly wheels attached to the spindles.

The fly wheel effect resulting from these rotating balanced members serves to dampen the impact blows inherent in the use of coarse pitch cutters as are common in carbide steel milling. These impact blows delivered when the tooth enters the work piece, affect the machine members such as gear trains, spindle bearings and the cutter tips. These impact blows serve to shorten the life of the carbide and thus reduce the number of passes and the amount of metal removed.





Fly Wheel Keyed to Arbor

Where standard machines only are available, carbide steel milling can be performed without benefit of fly wheels. The effect on the machine and the cutter as already mentioned, will not be particularly damaging if the recommendations in the section entitled "The Job and the Machine" are followed.

It is, however, a simple matter relatively speaking to install a fly wheel on the arbor of a horizontal machine as shown in Fig. 3. Such a fly wheel should be carefully balanced, properly keyed to the arbor and set as close to the cutter as possible.

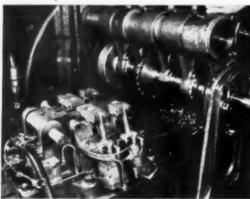
Fly Wheel Built Into Machine

A variation of the method just considered is shown in Fig. 4 where a fly wheel has been installed at the rear of the column on the end of the spindle in a Horizontal Knee Type machine.

If a fly wheel is installed on a spindle nose, its diameter should be limited so as to keep the surface feet per minute of the fly wheel below the bursting speed when operating the spindle at the maximum rpm.

The operation of a machine equipped with a fly wheel requires care and con-





THE ILLUSTRATIONS— Figs. 1 and 2 showing horizontal and vertical kneetype milling machines appear in their respective order.

(Fig. 3 (above) shows a flywheel and milling cutter set-up.

Fig. 4 at the left shows flywheel installation on milling arbor.

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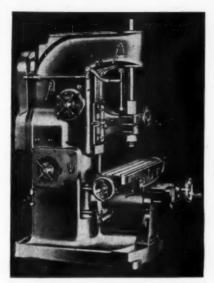
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sideration. Clutches may be damaged easily if the spindle is braked excessively to reduce the speed from a maximum to zero.

Spindle bearings are quickly damaged unless the fly wheel is balanced, particularly if the spindle is operated at its maximum speed with an unbalanced fly wheel. All fly wheels should, therefore, be carefully balanced before installation.

RECONDITIONING CUTTERS

Important for the success of carbide steel milling is the proper reconditioning of cutters. This will be considered under these headings:—Brazing, Adjusting Solid Wedge, Grinding and Grinding Equipment.

Brazing

This exposition will not include a complete treatise on brazing. The subject has been treated elsewhere by specialists in this field. Reference is made here particularly to this pertinent literature:

Kennametal Catalog No. 43C, pages 37 and 38.

"Brazing" by the Carboloy Company.

"Carboloy Tool Manual" Engineering Bulletin GT-133-R, pages 26 and 27.

The brazing of steel cutting grades of carbide either to a shank or a cutter body requires skill and careful workmanship. These grades of carbide differ from the cast iron cutting grades. They are harder and shrink more than straight tungsten carbide.

The brazing of steel cutting carbide can be done either with copper or a silver solder.

Induction brazing instead of a flame may be used to advantage where such equipment is available.

Brazing of steel cutting carbide tips on solid bodies should be done only on one side of the tips and not on the edges. It must be remembered that the cutter bodies shrink twice as much as the carbide tips, placing the latter in tension for which they are not well suited. Leaving the carbide tips free around the edges provides room for contraction and expansion.

Preliminary tests indicate that where possible, it is advantageous to subject carbide-tipped cutters to this cold treatment:



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-Immerse cutter for two hours in 120° F below zero. This is done from room temperature and not from a pre-heat. At the end of two hours, cutter is removed and allowed to return to normal room temperature.

Such treatment affects the brazing between the tip and the body and by it, the brazing strains are somewhat relieved. This is indicated by increases in production of from 30% to 50%. Consistency of results is also more noticeable after such treatment, i.e., there is a closer approach to the same number of pieces per grind after each reconditioning.

Solid Wedge

Where the solid wedged type of cutter a used, brazing is, of course, no longer a problem. But the assembly of such cutters and the adjustment of the blades must be carefully made. As the carbide blades are ground to the periphery of the cutter body, subsequent adjustment is necessary. The wedges (see Fig. 5) are partially loosened, the blanks carefully tapped to free them for adjustment to a gage or template. Overhang of the blade with regard to the cutter body preferably should be more than 1/32".



Fig. 5—This 8" face mill has wedged solid carbide blades.

Both the cutter body slots and the blades should be free from all dirt and foreign matter before adjusting and tightening the wedges. This should be done by Radiform

Production on part shown was increased from 40 to 500 pieces per hour with Radiform Generated Carbide Cutters like the one shown.

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a gradual tightening of all the blades successively rather than completely wedging each blade at one time.

Grinding

Instructions for the grinding of milling cutters have been expertly set down in these bulletins and catalogs:

Kennametal Catalog No. 43C, pages 34 and 35.

"Ingersoll Cutter Grinder" (entire bulletin devoted to cutter grinding).

"Grinding Cemented Carbide Milling Cutters and End Cutting Tools," Carboloy Engineering Bulletin No. GT-127.

"Grinding Wheels and Their Uses", Heywood—Chapter 10, pages 82 to 96 (Penton Publishing Co., Cleveland, Ohio.).

In grinding carbide steel milling cutters, the foremost consideration is the grinding machine to be used. The machine and grinding set-up should be of a rigid nature, thus permitting use of diamond wheels.

In selection of the wheel, use a diamond wheel of the cup or peripheral type depending upon the machine involved in the grinding. Regardless of wheel type decided upon, use a wheel having 100 grit concentration of diamonds, 1/16" deep. In no instance should green grit Silicon Carbide wheels be used for grinding steel cutting carbides.

It is well to note at this point that wheel life in the grinding of carbides is a very important consideration from an economic standpoint. Diamond wheels are more costly than the green grit Silicon Carbide wheels used in the grinding of cast iron and non-ferrous grades of carbide and therefore should be given careful attention to insure long life. It has been found that the life of diamond wheels can be increased greatly by providing some form of coolant or lubricant to the wheel during the grinding operation. The wheels can be run dry, but it is suggested that wherever possible, an oil cup with a wick resting against the wheel face, applying a suitable coolant be used. Many types of coolant can be purchased which will work very satisfactorily, such as commercial kerosene, soluble oil, plain water or Socony-Vacuum Oil PD-541-6D, Stadoil, etc.

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There are two definite types of Cutter Grinding machines, the main difference being that in one machine the cutter is traversed across the wheel which remains in a stationary position. In the other, the cutter remains stationary and the wheel is traversed across the cutter. For the sake of simplicity, the instructions given will apply to the latter type.

To begin the actual grinding set-up, first take cutter and carefully examine back face and bore for any nicks or scratches. In the event such a condition exists, stone the back face to remove the burrs. Should the face be badly marred, place cutter on an integral grinder and regrind the back face.

Next carefully clean spindle bore on the cutter head of the grinding machine, and examine carefully for any foreign matter which might cause inaccuracy in the finished ground cutter. The spindle on which the cutter is mounted should be checked frequently and should at all times have no more than .0002" run-out. Then place a centering plug in the spindle taking the aforementioned precautions to insure accuracy in the arbor. Clean the back face of the face mill and slip on the centering plug. Then bolt cutter firmly to cutter head spindle. In the event of small diameter face mills mounting on a style C stub arbor, if possible mount cutter on the arbor and do not remove the cutter from the arbor after sharpening. If it is necessary for some reason to remove cutter, be careful in remounting cutter to another arbor that it is in good condition so as not to lose any accuracy of the original grind.

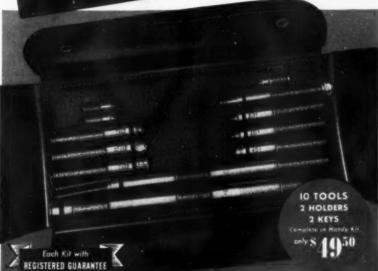
Now that cutter is mounted to the cutter spindle, place diamond wheel on the wheel head spindle, and lock it firmly in position. Next adjust cutter so that the blade faces are in a parallel plane to the wheel face. Start grinding spindle.

While revolving cutter slowly against the direction of wheel rotation, feed the wheel head in slowly until the highest tooth comes in contact with the wheel. Continuing to rotate cutter slowly, feed wheel head in about .0003 to .0005" at a time until a flat has been formed at least '\(\)'' wide on each blade. Then feed in wheel about .0001 to .0002" for a final

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THE CAPEWELL MFG. CO. Hartford, 2, Conn. finish cut and revolve cutter slowly until all blades are cleaned up equally. CAU-TION! Under no circumstance should wheel be permitted to dwell while rotating and in contact with a carbide blade as this will cause the tip to heat and may crack the carbide. Also it is advisable to dress the wheel before grinding every cutter to insure a clean free cutting wheel.

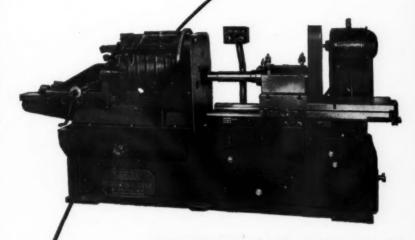
The cutter is then ready to start grinding Primary and Secondary clearance angles and the face dish. Leave the cutter head setting as in the circle grinding operation and either raise or lower the wheel head, depending upon the hand of the cutter, 41/2 to 5°. This will form the Secondary clearance angle. This angle should be running back from the cutting face to the tip. The next step is to set the finger rest, for use in indexing the cutter while grinding. First take a spirit level and place it on the cutting face and bring blade into a level position. Then place finger against face of the blade and lock in position. Adjust cutter to permit wheel head to clear the preceding and the following teeth. Start spindle of wheel head and check rotation. Wheel rotation should always be against the indexing finger.

The machine is now set for grinding the secondary clearance. Never grind the primary clearance first. If this is done the cutter must then be backed off, which will not give the proper accuracy required. Move the wheel head in slowly until first tooth is contacted. Holding cutter firmly against finger rest, traverse wheel slowly across tooth face. Index to the next tooth and repeat. Keep feeding the wheel in until the secondary



Designers frequently come up with designs which serve their purposes admirably, but present machining difficulties. A typical example is this large gear case which had several bearing bores located deep in the closed end of the case, making accurate finish very difficult.

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clearance is cleaned up all the way across the tooth face. When the secondary clearance is cleaned up on all blades, reset the wheel head to 2% to 3°. Then repeat the grinding procedure as before until a land 1/32" wide is formed on each blade running back from the face of the blade.

The next step is to move the cutter head 2° to form the face dish. This angle should run from the outer point of the blade on the O.D. of the cutter, back toward the center of the cutter. Reset the wheel head to 4½° or 5° and grind each blade until the 1/32" land formed by the primary clearance of 2¾° to 3° extends ½" from the point of the blade back toward the center of the cutter. This should leave a land 1/32" by ½" on each blade. The cutter face is now finished.

The next step is to circle grind the O.D. of the cutter. Reset the cutter head to bring the corner angle of the cutter parallel to the wheel face. In the case of a cutter having 15° corner angle for instance, the cutter head would be indexed 75°.

Leave the wheel head set at 4½° to 5° and feed in the wheel until the highest tooth comes in contact with the wheel. Then spin the cutter slowly and traverse the wheel head back and forth slowly until all the blades have been cleaned up all the way across the ends of the blades. It is advisable to circle the cutter once or twice and then use a clearance checking gauge to be sure of the proper clearance. This is not absolutely necessary but is advisable as a spot check.

This brings us to the final operation. Set the cutter head to a 45° angle and grind a chamfer on each blade 1/64"

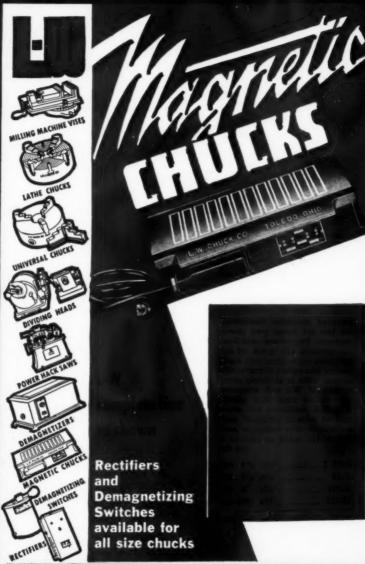
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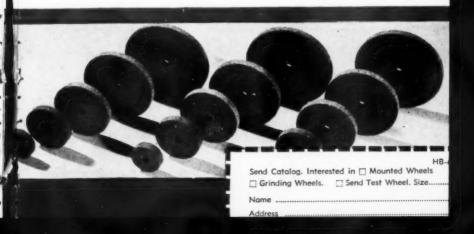
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wide. This is merely to break the corner and prevent the blade from chipping when put into operation. The cutter is now ground and ready for use.

In closing, these points should be stressed:

- 1-A rigid Grinding machine.
- 2-A rigid Set-up.
- 3-Use Diamond Wheels.
- 4-Don't remove more than .0005" of carbide per pass.
 - 5-Use accurate arbors.
- 6—Keep Grinding equipment in adjustment.
- 7-Keep the locating faces of spindle and cutter free of any foreign matter, scratches, etc.
 - 8-Don't rush the work.

If these instructions are followed, an accurate and economical grinding job is assured.

Since steel cutting carbide is harder than the other grades and also harder than Silicon Carbide, it must be ground, both in the roughing and finishing operations with diamond wheels. A 100-grit diamond wheel is used for the roughing and 150-grit diamond wheel is used for the finishing operation.

In addition, it is advisable from a cutter life standpoint to hone the faces of the cutting tips. This is performed with a 500 to 800 grit diamond hand hone.

A cutter used for the milling of steel should never be operated beyond the point where more than .010" has to be removed from the carbide tips. To operate the cutter beyond this point is uneconomical both as regards grinding cost and overall cutter life.

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Diamond shells for grinding should always be operated wet, preferably with a wick and a lubricant for the purpose. This will serve to lengthen the life of the diamond wheel in grinding.

The cutting edge of the tip should be "broken" by grinding a slight chamfer in it.

To summarize, the grinding of the O.D. and the face of these tips should be done by "spinning", i.e., the cutter should be revolved and the periphery ground while the diamond wheel brings the higher teeth into the same circle with the lower. This should be continued until all cutting edges are in the same circle to within a few "tenths". The same technique is repeated on the face. At no time should the grinding wheel feed be more than five tenths, i.e., not more than five tenths of carbide should be removed in each pass of the diamond wheel. This is important from the standpoint of diamond wheel life as well as prevention of carbide tip cracking. And at no time should the diamond wheel be permitted to "dwell" at any point on the carbide tip.

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Conclusion

From the foregoing, it is obvious that conversion to carbides in the milling of steel can be made with standard equipment of normal horsepower rating. The advisability of converting to carbide is frequently questioned. The increase in the feed rate, obviously, with normal standard equipment is not startling. While in many instances it can be increased from four or five inches to double that amount, it is also sometimes true that using present-day equipment with standard horsepower rating, it is impossible to increase the feed rate at least to any considerable extent. The question then arises:-Is conversion to carbide, under such conditions, advisable?

It may not have been made apparent in the foregoing paragraphs that such conversion is eminently desirable and worthwhile and economical even tho an increase in the feed rate is not possible.

The reason why this emphatic statement is made should now be carefully set forth:

In the first place, conversion to carbide eliminates coolant and the attendant difficulties of using the wet method. (2) Conversion to carbide means less heat

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in the workpiece and therefore less distortion due to the heat of work. This frequently results in the ability to work to closer tolerances. In fact, many operations today are being performed with carbides by milling in the heat treated state in one pass to the finished dimension. The same operations with high-speed steel must be performed by milling in the untreated state, and then finish milling in the heat treated state. (3) The finish with carbides is far superior to that with high speed steel and thus frequently permits elimination of subsequent operations such as grinding. (4) As indicated previously, it is now possible with carbides to mill alloy steel in the heat treated state; numerous operations today are being performed on steels that have been heat treated as high as 45 Rockwell C. In fact, operations on alloy steels up to 60 Rockwell C are possible. However, from a production standpoint, reference is here made to milling of alloy steels that have been treated to 400 to 420 Brinell or approximately 40 to 42 Rockwell C.

Finally, the use of carbide reduces the downtime on a machine necessary when cutters must be removed for grinding and reconditioning. Carbide milling cutters permit milling far more pieces between grinds than high-speed steel. The increase frequently is as much as two and three times, and thus the total amount of downtime on the machine is reduced very considerably. This, of course, all adds up to reduced unit cost in manufacturing, and is therefore, highly desirable.

These advantages make advisable the use of carbides on all operations where milling cutters for the job can be designed and built, even tho there is no

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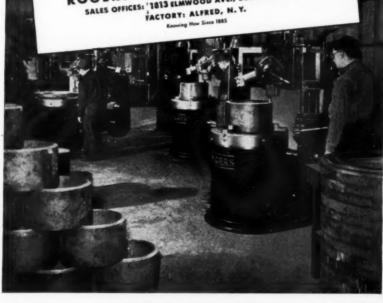
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increase in the feed rate. Unfortunately, the stepping-up of speed and feed in the use of carbides has been so over-emphasized and stressed that the other attendant advantages are frequently forgotten. It is well, therefore, that these be set down at this point and thus emphasize the fact that conversion to carbide is advisable even tho there is no increase in the feed rate or the rate of producing pieces by this method of milling.

By way of summary, these points may

be worthy of repetition:

1—Carbide steel milling technique can be performed on standard milling equipment as presently available.

2—The limitations of using this equipment, as noted, still make the use of this technique advisable and worthwhile.

3—A program of conversion to carbide milling of steel in any organization should be introduced by the practices recommended in this exposition.

4—Carbide milling of steel when used to its fullest advantage will increase production many fold and assure superior products in both finish and tolerances.

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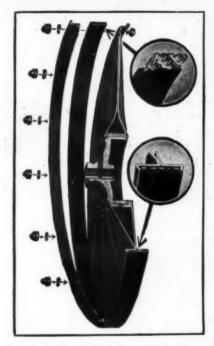


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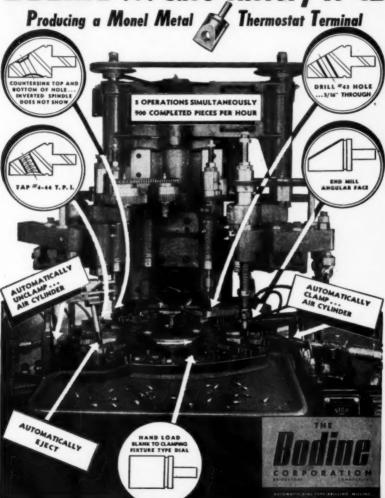
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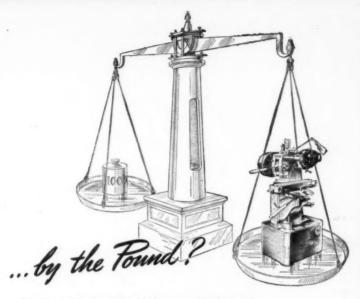
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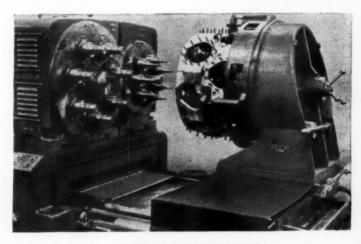
This is the first of a series of articles telling of proved shop methods which obtain the utmost in accuracy and surface finish, on a high production basis, by means of the "fly-cutting" technique—Editor.

T O realize the full capabilities of a machine tool it is necessary to know not only how to use it to best advantage, but to have definite knowledge of just what it can and cannot do. Many a machine tool falls short of its possibilities because neither management nor men really know its full possibilities.

This seems to be especially true of the machining process commonly called "Borizing". The term is not entirely descriptive of the process, for it inevitably suggests boring, and so too often limits a very versatile process to a small part of its potential capabilities.

Borizing is in fact a development of "fly-cutting"—that old standby of the toolroom for producing more accurate holes than could be drilled, by boring

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Later, the use of diamond tools which cut at high speeds put "diamond boring" on a high production basis. However, diamond tools were limited in usefulness because they were expensive, were apt to break under sudden shocks, and could be used only on certain non-ferrous metals.

The introduction of cemented carbide tools in 1928 made fly-cutting a real production method of boring. The carbides resist abrasion and heat, can satisfactorily machine materials which contain hard spots, remain sharp for long runs at very high speeds, have higher tensile strength than diamonds, can be used on interrupted cuts, and can be fabricated into tools of any shape at reasonable cost.

With these qualities in the tools and the demonstrated advantages of boring with single point tools at fine leads and high speeds, it was inevitable that mechanics should think of adapting the flycutting method to machining operations other than boring. So machines were developed for the purpose. In addition to building them rigid and free from vibration, they were given high spindle speeds and were so designed that they would not only do boring, but would give equally accurate results at high production rates in turning, facing, chamfering, grooving and milling. That, when done with single point cemented carbide or diamond tools on specially designed machines, is what is known as "borizing" or sometimes even as "precision boring".

Since all of these operations can be done on a single machine, and sometimes at a single set-up, we obtain not only the accuracy of dimension inherent in flycutting, but accuracy of each surface with relation to a locating surface and of each surface to every other surface.

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In order to assure the greatest accuracy at high speed, it is well for the operator, the designer and the shop executives to understand just why it is that this method is so accurate. Otherwise, mistakes may be made which may reduce either the accuracy or the production.

The dimensional accuracy of a surface for size, roundness and straightness obtained by "fly-cutting" is due to these factors:

1—Surfaces are usually generated, altho the more narrow surfaces also can be shaped with form tools. When a surface is formed, it is plunge-cut to the shape of the tool. This, of course, is satisfactory in some work, such as chamfers, grooves, etc. One trouble with form cutting a surface, especially complicated shapes, is that the tool must be ground to the reverse form, which in itself opens the way to error. Then, later, when the tool must be re-sharpened, it is usually quite difficult to maintain the original form.

When a surface is generated with a single point tool, the tool is moved by readily controllable means in the path it is desired that the surface take. Special contours, such as found in aircraft pistons and bearings, therefore are borized by this method by means of cams. Oher symetrical shapes like spherical O.D.'s and I.D.'s are generated by spherical attachments. Obviously, boring and turning, whether straight or tapered, are also generating operations. Flat surfaces too, are accurately produced by generating with a single point tool. So are chamfers.

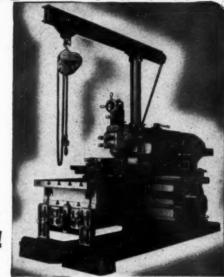
2—As a rule, stock is removed in light cuts with fine leads. This gives light tool pressure which prevents damage to the surface either by tearing or overheating. This is the basic secret of the accuracy of fly-cutting, of course. But at ordinary speeds the process would be very slow. Therefore to get high production it is necessary to combine small leads and light cuts with high surface speeds. This can only be obtained with accuracy with diamond or carbide tools and very rigid machines.

When the accuracy and finish required are not of the highest degree, it is pos-



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sible under certain conditions to remove considerable stock, taking a single cut from the rough. But since the big field for borizing is strictly precision work, it is advisable to design the part for minimum stock removal, or arrange to have the heavy material removing done in a previous operation.

Properly used, borizing will give as high accuracy and surface quality as cylindrical, internal and surface grinding. While the extremely hard materials must be ground, because abrasives will cut material that no tool can, borizing is preferable on the softer materials which are apt to clog or load the wheel and so give slower production rates.

The tolerances achievable depend somewhat upon the size and shape of the machined surfaces, the size and rigidity of the work piece, the kind and quality of the material, the amount of stock to be removed, the condition of the surface left by the preceding operation, and of course, the condition of the machine.

These tolerance figures are taken from actual shop operations on a high production basis, but it should be remembered that they reflect practically perfect conditions. However, if the necessary care is used, borizing can be expected to give a degree of accuracy that approaches these limits:

Thus, it is possible to bore or turn cylindrical surfaces, internal or external, to tolerances as close as .0001" for size, roundness or straightness.



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Very close accuracy for flatness, squareness, concentricity, alignment and spacing can also be obtained. For example, the faces of refrigerator cylinders are held to tolerances for flatness of .0001".

Squareness of face to bore on ball bearing seats is held to .0002".

The spacing of impeller pockets in aircraft pump bodies is held to .0002". Concentricity between outside diameter and bore of surveyors' transit centers is held to .0001".

Very close limits as to location can also be obtained, as for instance in the aircraft engine crank-case shown set up on the machine. Fifty-six holes in this part are finish-bored to a tolerance of .001" for relative spacing. The machine shown is equipped with two multiple spindle boring heads, each of which has a bank of seven spindles. Seven groups of holes are bored simultaneously. The crankcase is held in a fixture attached to an indexing cross-slide. This permits transverse positioning of the case to do two series of operations with each group of quills. Interchangeable tool quills are used.

An accompanying table gives the limits reasonably to be expected in good commercial practice when finishing a hole 1" diameter by 2" long with 1" wall in a good grade of cast iron.

| Method | Size | Roundness | Straightness |
|--------|--------|-----------|--------------|
| Drill | .005" | | .001" |
| Ream | .0005" | .0005" | .0005" |
| Broach | .001" | .0003" | .0003" |
| Hone | .0002" | .0001" | .0002" |
| Grind | .0002" | .0002" | .0002" |
| Borize | .0002" | .0001" | .0002" |



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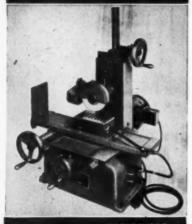
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With the development of such surface quality measuring devices as the profilometer and the surface analyzer, designers are giving more attention to specifying the exact surface quality required—no better and no poorer.

As a guide, the accompanying figures can be relied upon to indicate the surface quality in micro-inches root mean square that should be obtained with various commonly used metals using standard machines which are in good condition.

> SURFACE QUALITY in micro-inches root mean square

| MATERIAL High quality alumi- num, babbit, bronze, | in micro-inch root mean squ |
|--|--------------------------------|
| or magnesium | 15-20 |
| Good quality alumi- num, babbit, bronze, or magnesium. | 25-30 |
| High quality cast iron | 25-30 |
| Good quality cast iron | 40-60 |
| Fair quality cast iron | up to 200 |
| Steel | 20-200 |

The variation in surface qualities attainable is due chiefly to variation in the physical structure of various metals which influence their cutting characteristics. For instance, excessive porosity makes for higher profilometer readings; that is, for a rougher surface.

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High surface quality is difficult to obtain in machining steel because relatively coarse leads must be used.

It is to be noted that the values given for surface finish are based on using standard machines, equipped with anti-friction bearings. Thus 15-20 micro-inches rms is the best surface that can be expected for aluminum or magnesium. But surfaces as fine as 2 micro-inches rms are procurable on certain materials by using special machines equipped with plain bearing boring heads, and especially designed to keep temperature fluctuations and the transmission of vibration at the lowest possible levels.

However, even tho super-fine finishes of 2 micro-inches have been obtained under production conditions, such cases are the exception rather than the rule, and are only possible when the material being finished is of the finest possible quality.

(To be Continued)

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BALL BEARING VERSATILITY

By H. F. WILLIAMS

"Jewels of industry" might be a fitting title for these sometimes overlooked mechanical masterpieces. Many articles have been written about ball bearings as assembled units but little has been done about presenting a collection of applications in which balls alone are featured. This series of articles deals with such applications, not only of steel balls but also those made up of several other materials. Editor.

If HILE the use of steel balls is synnomous with the ball bearing industry, the purpose of this article is to place emphasis in the main on the applications of balls as separate units. In most instances, as shown in the accompanying designs, they are used singly rather than in multiplicity as in groups of balls following annular paths. However to obtain a complete picture the use of balls in machinery, there are a few isolated cases where several balls are used in a single application but without the use of confining separators as in annular ball bearings. Primarily the applications are explained briefly but the merits of designs are left to the reader's own judgment

Because the ball is such an outstanding specimen of mechanical perfection as will be evidenced later, the manufacture of hardened steel balls is a story in itself. Very briefly, the finest chromium steel is used. The smaller balls are cold forged, the larger ones hot forged. In a progres-



Precisioned to measurements of one-millionth-of-an-inch, the mirror-like steel balls that find their way into bearings for AAF planes and bombers must be spherically perfect and free from fingerprints or scratches. Millions of them are made here in the plant of the Strom Steel Ball Co., Chicago. Colonel R. L. Finkenstaedt, Commanding Officer of the Air Technical Service Command, Midcentral District, is shown examining a tray of balls in the Strom factory, while Robert and George Strom look on.

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sive series of operations they are rough ground. They have a minimum hardness of Rockwell C 60. Then follows a rough and finish grinding with oil, final burnishing and meticulous inspection.

There are four grades from which the mechanic or designer may choose. The "hardware" grade which can be used in many of the designs shown has a sphericity within .001" and -.002" of size. The third grade "A" balls have tolerancse of -.0002" of size and within .0002" of being round. In the "Standard" or second grade. sphericity is within .00005" and size -.00005". Balls in the first grade are the truest that can be made, the sphericity being within .000025" and the tolerance for size of -.000025" or in both cases 25 millionths of an inch. The latter grade is used in all high-class, high precision ball bearings where it is necessary that the variation in the group of balls that make



"I've got a son who is an AAF pilot and I'm going to stay right here making ball bearings for planes until the war is over"—says Mrs. Frances Spencer, an employee of the Ahlberg Bearing Co., Chicago. Shown are Colonel R. L. Finkenstaedt, Commanding Officer of the Air Technical Service Command, Midcentral District, and Fred Burkholder, President of Ahlberg.



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70 SPRING STREET NEW YORK 12, N. Y. up the bearing be the most minute. Several instances will be cited where it is desirable to use balls of the highest grade to obtain the best results.



Annular races for propeller bearings in the famous Superforts are made by the millions in Chicago at Aetna Ball & Roller Bearing Co. Shown are Colonel R. L. Finkenstaedt, Commanding Officer of the Air Technical Service Command, Midcentral District, and George Nordstrom, President of the bearing company.

In the first few illustrations, hardened steel balls are used as anti-friction thrust members. Fig. 1 shows a ball mounted on a lower bearing made of a very hard alloy or on a jewel. The latter is assembled tightly in the lower member by spinning over the top and there is a concave depression in which the ball finds its own center. The hardened steel shaft is countersunk at an angle of 90° included and lapped to a high polish, thereby giving a ring contact on the upper side of the ball while the lower contact is a point.

Sometimes a jewel is enclosed in the stem of the upper member as in Fig. 2 so the ball is mounted between two jewelled bearings. Agate, sapphires and rubies are used in bearings of the design shown in these two illustrations.



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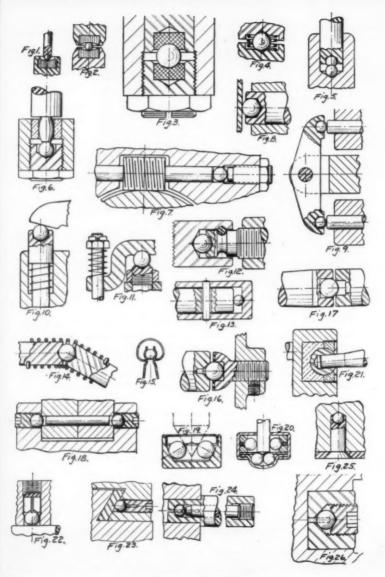
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The design used in Fig. 3 has a composition bearing material at each side of the ball to absorb the thrust load. In this particular instance it is of the oil-less variety. The lower slug is mounted in a screw used for positioning the assembled shaft above and for any possible adjustment that might be necessary. It can be locked in place by the check nut.

In Fig. 4, a hardened steel ball runs in two conical depressions made by the point of a drill of approximately 120° included angle. When pressure is put against the lower member, the spring is rendered inoperative. When pressure is released, the spring forces the upper and lower pieces apart a slight amount letting the ball rest

freely in the lower depression.

Two balls contact each other in Fig. 5, altho the upper one is flattened a slight amount. It is pressed into the end of the shaft and peened in. It is then ground flat while the shaft is revolving thereby assuring that the flat is at right angles to the axis of the shaft. The lower ball is centered in the conical ended hole as left by the drill. When assembling, the space below the end of the shaft is filled with oil or grease for lubrication. Capillary attraction is relied upon to carry the lubricant up around the rotating shaft.

In Fig. 6 the spindle is supported both radially and axially. The end of the spindle is turned to a barrel shape and is later hardened and form ground. It rides in a hard bronze bushing and against a hardened steel ball. The whole assembly is adjustable endwise by the locked screw. In this design the barrel shaped contour of the shaft allows for misalignment of the shaft; in fact it is self-centering. The adjusting screw being hardened, is polished at the ball seat. In this construction the hole in the screw and the space above are filled with grease for lubrication of both ball and radial bearing.

Light end thrusts in small worm gear assemblies may be taken by a single ball as shown in Fig. 7. Here the shaft is pressed into the worm at assembly and kept by a key. Capped bearings also can be used. The ball is adjustable by the headless screw and is of about the same diameter as the hole for the shaft. The same design can be used for helical gear assemblies in which light loads exist. Oil





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In Fig. 8 the diaphragm chuck is actuated by a ball mounted in the end of the operating rod. In such a chuck, only a very slight amount of movement of the jaw is necessary; in many cases only several thousandths of an inch. The jaws are made integral with the back plate or diaphragm which is represented as against the ball in the sketch. The ball gives a point contact against the center of the diaphragm distorting the metal enough to open the jaws a slight amount. The ball is pressed into the shaft and peened over.

The lever in Fig. 9 for transmitting movement from one shaft to the other is drilled at either end to accommodate two hardened steel balls. A rolling action takes place between the shafts and balls which previously was a sliding movement. The balls are peened in loosely, just enough to retain them in the holes but loose enough so they can turn.

For light press work, the top of the plunger or ram in Fig. 10 is recessed for a hard steel ball. The actuating lever as shown above is a steel casting, hardened. The ball is inserted loosely in the hole so that a roling action takes place between ball and finished surface of the end of the lever. When foot pressure is released from pedal, the spring returns ram after the downward stroke. The ball always contacts the lever so that peening-in is not necessary. Such a punch is used to stamp out or form pieces made of fiber or plastics and for sheet steel of the thinner gauges.

A heavy spring thrust load is supported in the arangement shown in Fig. 11. The



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spring yoke, which altho not shown. is the same either side of the center-line. In the center of the yoke at the lower surface, a partial spherical depression is machined to rest upon a good-sized ball while the upper end of the rod mechanism is machined conically to accommodate the ball.

The swiveling clamping or jack shoe illustrated in Fig. 12 relies on a hardened steel ball to take a heavy end thrust and swiveling action at the same time. Because the face of the shoe is machined with diamond shaped serrations to prevent slipage and to increase bite, action of the screw must be such that rotation of the screw is not transmitted to the shoe. The shoe is retained on the end of the screw with a pin engaging a loose fitting annular groove. The end of the screw may be machined out either with a hemispherical or conical shaped depression. The ball may be larger or smaller depending on the load to be supported. The space around the ball is grease packed when used in the position shown and filled with oil when used vertically.

In Fig. 13 is shown a method of taking end thrust of a floating reamer. The reamer shank is drilled to loosely fit a pin fastened in the reamer holder. While the ball rests in the countersunk hole comparatively shallow depth, the pin hole should not be large enough to allow the ball to leave its seat. The end of the reamer has a square and smooth surface. With this design the reamer can move angularly, side ways and up and down.

The ball is most ideally suited to act as a pivoting or swiveling member or even as a hinge. In Fig. 14 is shown a coupling

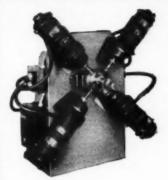


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or flexible pivoting joint which is used for transmitting light to medium power thru shafts that are out of alignment. The ends of both shafts are machined out in which to nest the ball and are case hardened and lapped to prevent excessive wear. A helical spring has each end bent in to simulate keys, engaging holes drilled in the shaft.

Fig. 15 illustrates the principle used in a well known paper clip in which a pair of balls are used as the hinge on each end of the clip. The paper holding members are pressed out at the joint with small spherical depressions into which the balls fit. A hoop spring made of flat stock keeps the balls in place and clamps the papers at the same time.

The spindle pivoting arrangement shown in Fig. 16 allows ease of rotation or oscillation to the swinging member of the assembly. The shaft is countersunk with a combination centering drill and reamer at a 60° included angle. A specially headed screw is recessed to accommodate the ball which is retained with a thin plate tack-welded to the

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screw head. Positioning and adjustment are made with a hex, wrench fitting the end of the screw which is locked in place with the brass shoe beneath the set screw.

In the next design of a trunnion center as illustrated in Fig. 17, the oscillating member is merely counterbored at the end, the ball contacting the lip of the counterbore. The retainer opening for the ball is deep enough so it can be peened over slightly but rotatively loose. This set-up can also be used for centering a piece of work that must be turned or ground especially when rotating tapered work on off-set centers.

Another form of hinge is shown in Fig. 18, in which two swinging members are pivoted on a ball at each side with a pin between them. Altho the clearance is not shown it is assumed, of course, that these members are loosely fitted in the main casting. Each ball is adjustable by use of a cup point set screw. In another design similar to this one a ball was placed in the center between the two swinging pieces and the pin omitted.



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These leaves were counterbored for the ball. The latter design was used for a lightweight jig.

A small precision pivot bearing, illustrated in Fig. 19 is used in instruments and equipment formerly employing jeweled bearings. It is made by the Miniature Precision Bearings Co., Lebanon N. H. It is about 200" outside diameter (5 millimeters) and supports a pivot shaft as small as .050". The housing or ball race is hardened and accommodates four 1/16" chrome steel balls whose tolerance is .000025". The whole assembly is only about .100" high.

A similar bearing of foreign design in Fig. 20 has two sets of balls supporting the pivot shaft both in axial and radial directions. It is so arranged that the shaft is movable upwards when necessarv. The end of the hardened pivot shaft is hardened and ground and contacts the balls approximately opposite the ball seat in the race. The upper set of balls supporting the shaft radially, runs between hardened raceways. The lower raceway and outer retainer are

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made of sheet steel, the latter being spun over at assembly.

A soft polished steel ball in Fig. 21 acting as a pivot is drilled and reamed to accommodate a rotating and sliding shaft in an eccentric arrangement. The housing is reamed out, into which is pressed a cupped socket made of hard bearing bronze. A ball retainer cap of similar material is screwed against the socket. The ball is free to oscillate.

The ball may also be used as a lock or retaining means applied to a number of devices as illustrated in the accompanying figures. In Fig. 22 it is desired to retain a member where it is not permissible to have a lock nut protrude beyond the upper surface of the assembly. A ball is placed in the tapped hole against which is screwed a socket set screw having a cupped end. The screw is slotted four ways so that pressure against the ball expands the screw enough to hold it fast in the tapped hole. Similarly an adjustable gib is held in place by a slotted cup pointed headless set screw as shown in Fig. 23. Lock nuts

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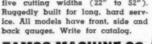
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are not required. After the screw has been slotted it is spread slightly with a screw driver or similar tool and heat treated. Made of a .40 percent carbon steel, it should not be so hard as to be brittle but should be springy. The ball is first inserted to fit into a suitable depression in the gib. The screw is then put in the tapped hole springing down to the correct size. When it contacts the ball, a slight spreading effect takes place, enough to retain the screw but not enough to clamp the gib against the slide. If the end of the screw is not spread before being inserted into the hole, the ball will tend to spread it but the pressure will be too great perhaps sufficient to make the gib bind against the dovetail.

In Fig. 24 it was required to anchor a stud in place in a blind hole without the necessity of tapping and locking the screw end against looseness. Here the end of the shouldered stud is slotted and a hole drilled past the upper end of the



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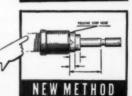
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Another method of retaining a rivet, stud, screw or plug is illustrated in Fig. 25 for comparatively small diameter work. In such cases it is assumed that the assembly is permanent, i.e., it must be dislated out when the pieces have to be disassembled. The end of the piece to be retained is drilled out slightly smaller than the ball to a depth of about 75 to 80 percent of the ball diameter. As the piece is driven home the ball spreads the metal around the hole in the held member to hug tightly the wall of the hole in the body.

When it is not possible to slot the screw, especially when the screw is too short to get sufficient expansion and the piece to be retained is also fairly narrow or short, the latter can be slotted as shown in Fig. 26. This may be a plug or a sliding member in a straight or circular slot, such as a dog or other adjustable piece where the protrusion of a nut would increase necessary clearance or hazard when rotating. In flush clamping of this kind, the piece can be made of cast iron if necessary, but should be heavy enough in section to prevent cracking due to the spreading action of the ball.

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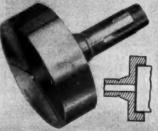
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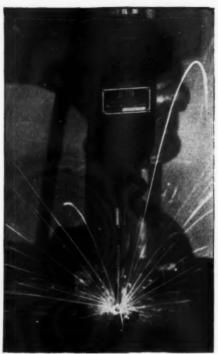
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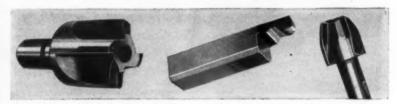


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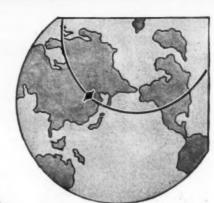
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CONTROLLING OVERHEAD

By ARTHUR ROBERTS

H IGH taxation has woven itself into every fibre of business operation. Hence, the machine tool user must consider every important element of operation with a more critical eye than ever before, otherwise, his pocket-profit may be nil. Pocket-profit is what you have left after the income tax is deducted. You can't spend your tax so net income or net profit loses the significance it had when taxation was on a much lower level.

In debating the pros and cons of our business economy, certain politicians, liberals, bureaucrats and social uplifters do not usually differentiate between net income before taxes and net income after taxes because this distorts the picture to the advantage of their arguments. Many businessmen, quite as erroneously, still think only in terms of net income before

taxes and base their plans and decisions thereon, whereas, the net income after taxes is the only safe basis for all business action.

To get back to our main thesis, a more critical appraisal of every important element of operation is imperative today to ease tax pressure. Overhead is one such element that, better controlled, may yield savings that will offset high taxation more or less. Many machine tool users consider overhead as one lump sum when it has two classifications—fixed and variable, as far apart as the poles. Before the war, those who considered overhead as "just overhead" may not have been troubled by this infraction of business analysis. Then, taxes and operating costs were lower, manpower and materials

These Never Get Tired, Sick or Absent PORTELVATOR (Elevating Tables)

A perfect record for attendance and performance and work full time, overtime or double-time. For lifting, "toting," stacking, as bench, for overhanging work, etc.

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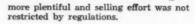
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Today profits depend much upon keeping costs cut to the bone. An increase in sales volume to bring down the overhead ratio to sales was feasible at any time in the days before Pearl Harbor, Today, it is often stymied by the inability to get manpower and salables; hence, expense reduction is the only way out, and if the fixed-to-variable expense ratio in overhead limits cutting power, then trouble starts. All businessmen suffer from wartime Gremlins, some more than others, and much of their trouble stems from the make-up of their overhead expense, otherwise, the ratio of fixed-tovariable outlay.

These figures are illustrative of the point I am trying to stress and show why one businessman may weather our wartime economy better than another. Of course, these are extreme cases, at opposite ends of the arc, but they serve well to illustrate this discussion, and being simple tabulations, they are easy to understand. Let's assume the first set of figures belong to Machine Tool User Jones and the second tabulation to Machine Tool User Smith. This is Jones' condensed profit and loss statement for the year of Pearl Harbor:

| Labor and | l materials | | 650,000 |
|------------|-------------|----------------------------|----------|
| Overhead | expenses | | |
| Variable | expense | \$200,000 100,000 se | (1) |
| Net*profit | on sales | | \$50,000 |
| | | condensed prothe same year | |
| Labor and | d materials | | 650,000 |
| Variable e | xpense | \$100,000 200,000 | (2) |
| Net profit | on sales | | \$50,000 |
| Both m | achine too | l users have t | he same |

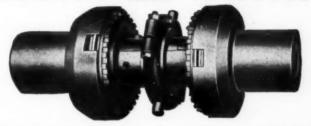
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net profit, but the ratio of fixed to variable expense is reversed. In Jones' case. it is a ratio of two fixed to one variable: in Smith's case, a ratio of one fixed to two variable. Smith, with twice the variable expense of Jones, has greater flexibility of operation because he has more freedom to reduce expenses if sales take a down-swing and this applies whether the decrease is due to manpower or materials shortages during a war, or lack of demand during a depression. Jones, on the other hand, has roped himself to twice as big an outlay on fixed expense, which he cannot cut, regardless of how volume behaves and with high taxation piled on top of this affliction, any businessman is in a bad way.

Many businessmen found themselves in this position when war came, when restrictions of one kind or another reduced volume, and they are the ones finding it tough sledding these days. Some have passed from the picture during the war, whereas, the Smiths have been better able to take things in their strides.

Fixed expense, if high, restricts cost control, which is a managerial essential today to offset high taxation. High fixed expense is due largely to an over-investment in fixed assets or high fixed liabilities and the machine tool user must watch this angle of operation. Otherwise, he will lose control over a substantial portion of his overhead if he lets his fixed expense ratio get too high and that is poor business policy always.

A certain ratio of fixed expense is necessary in all businesses because this classification is made up of depreciation,



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rent, insurance, mortgage interest, etc. Nevertheless, the machine tool user must keep it down to bedrock. Another reason why vigilance along these lines is more necessary today than in prewar days is the big increase in taxes, which are now in the category of a fixed expense, forcing up the ratio. Jones entered the war years with a high ratio of fixed expense. Then income taxes increased the load. which he couldn't lighten, regardless of reverses, whereas, Smith carried only 1/2 the load to begin with and could soften the blows from increased taxation or reduced volume by cutting some of his variable expense. Of course, both Jones and Smith had variable expenses but Smith had \$200,000 against \$100,000 for Jones, so the former had twice as big a field in which to cultivate economies.

When sales are high and profits good. few businessmen worry about overhead. When sales drop and profits shrink, overhead becomes a problem child. The fewer Smith's seem to solve this problem more easily and this is an enigma to the Jones's. The hectic conditions brought about by the war and high taxation, have given those with greater flexibility of overhead control an advantage over the Jones's who have relinquished their rights to the same degree of supervision by freezing up too large a ratio in fixed expense.

The postwar period will not change the picture. When that time comes, all machine tool users will invest more or less in postwar betterment because of the need for replacement equipment or additional facilities to take care of in-

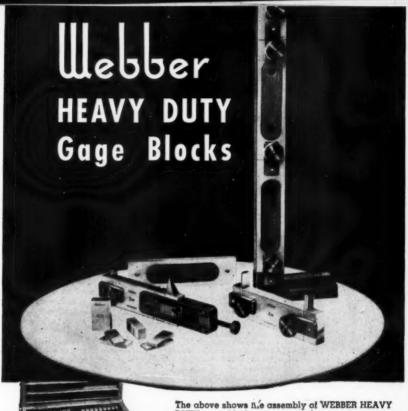


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creased trade. An eye must be kept upon the ratio of fixed to variable expense when making such investments, otherwise, the machine tool user will get into trouble if sales dip after the postwar boom has spent itself and he finds himself with heavy fixed charges that he can't cut in line with volume, and besides, has to pay heavy taxation. Lean years have always followed the fat and it pays to play safe on fixed expense regardless of rosy promises of perpetual prosperity. If we hit the hoped-for \$125billions-yearly-income, it will take years to pay the deficit, and don't overlook a backwash from abroad, when other nationals start producing and selling internationally. Yes, even with \$125-billions-yearly-income, it will take years to clean up the deficit and pay-as-you-go on current government expenditures.

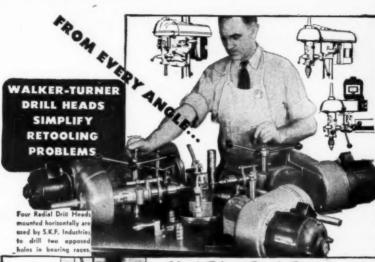
Whether it is a depression after the boom that reduces dollar volume, price control or a scarcity of manpower or materials due to a war, it all amounts to the same thing if your fixed expenses are inflated. You cannot effect maximum overhead control, thus, you pass up a good chance to salve your tax bill with economies in burden-so keep an eye on the fixed-to-variable expense ratio always. When you have a profit and loss statement prepared, have fixed and variable expenses listed separately and make the overhead allocation to production the same way.

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For a faster reconversion when the time arrives, it will pay you to look into the tooling possibilities of Walker-Turner Drill Heads, now!

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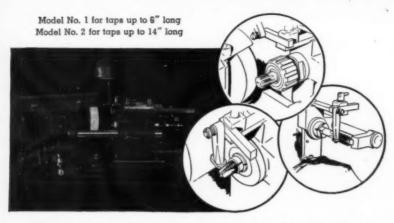
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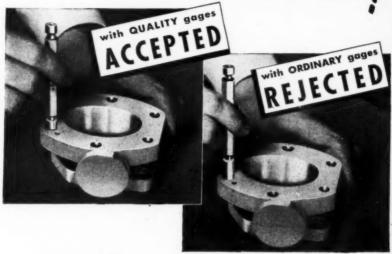
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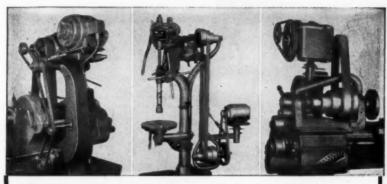
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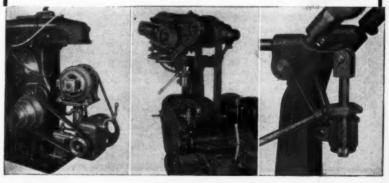
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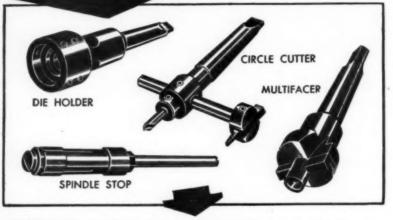


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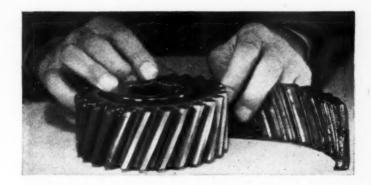
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is being conducted and its uses are increasing constantly.

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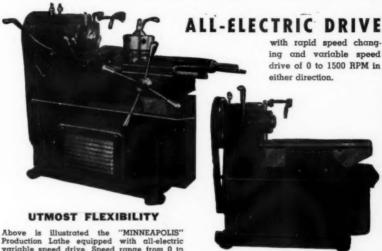
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The "MINNEAPOLIS" Production Lathe is extremely adaptable to any production set-up, particularly second operation work. Its simplified design and ease of control enable inexperienced operators to turn out high speed volume production.

The "MINNEAPOLIS" has 2½" collet capacity, 14" swing, heavy duty spindle assembly. It is backed by more than 50 years designing and manufacturing experience. Send for literature — write us your production problems. Send sample part or drawing if possible — let us quote you on a "tailor-made" lathe for your work.

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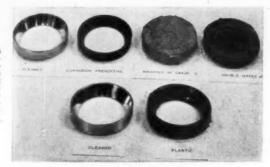
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The lower row emphasizes the simplicity of the Ethylcellulose method of pack-ing for shipment. There are just two steps — cleaning and dipping. The alterna-tive method involves cleaning, applying corrosion preventive, wrapping and double dipping.



protective value. Hot spots in equipment can cause charring and decomposition. Heating equipment must be thermostatically controlled and uniform in all sections of the dipping chamber. Additions of compound must be made frequently due to the fact the vapors carry off valuable oils and plasticisers from prolonged heating. Altho these compounds

are non-toxic, exhaust ventilation is recommended.

There are several procedures for application of Ethylcellulose compounds. One is the double dip method whereby first one section of the part is dipped and then overlapped with the second dip by at least 3/4", creating a weld of the material to itself. Another method of ap-



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At right: Hoffman centralized installation for filtering coolant from a large number of machines. Other Hoffman models are available for individual machine tools.



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U. S. HOFFMAN MACHINERY CORPORATION ST. Syracuse, N.Y. COOLANT FILTERS . FILTRATION ENGINEERING SERVICE



The simplicity of unwrapping, an Ethylcel'ulose protected roller bearing is evident. It's as easy as peeling a banana.

plication is by a single dip operation where a nylon, wax or cellophane cord has first been affixed to the part and the plastic is allowed to cover the part completely and travel up the non-wicking cord. Before packing in the final container, this cord is clipped, the short end of which is dipped in a special rust inhibitor or is again dipped in the Ethylcellulose Compound.

Due to the newness of this type of packaging material, it is required that instructions for its removal be included. This is a simple operation. A sharp stick is recommended to break the skin and it can be readily peeled as one would a banana.

The future of this material is being established. It has been found to be an excellent protection for carbide tipped cutting tools, precision tools and gauges. Many manufacturers of these tools and gauges, as well as users, are applying this type of protection to prevent damage thru oxidation, abrasion in shipping, or during storage in their tool cribs. Cost of the protection is very low in comparison with previous methods employed in this type of packaging.

New developments are in the offing, in the supply of this material in transparent or varied colors as a method of identification. How many new uses it will find in the post war era remains to be seen.

Don't be surprised if, when that long overdue total victory does come to our war weary world, you will peel a plastic compound from the special drill or cutting tool you have wanted so long. No doubt it will be the same material with the formidable title "Ethylcellulose Protective Stripping Compound."





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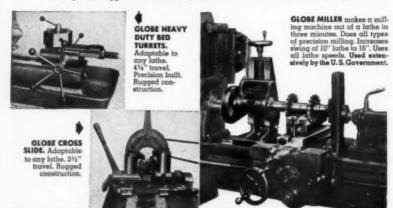
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IMPORTANT: When ordering or requesting prices on above items, be sure to give: 1. Make and model of lathe, 2. Lathe swing, 3. Power or hand cross feed, 4. State if lathe is equipped with telescoping taper attachment.



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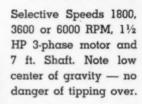
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This low-cost DURO Router-Shaper-Carver can be converted from one use to another in a few seconds

An ideal machine for these quick-changing times—when the ability to shift rapidly and economically from one set-up to another is vital.

Here is an unusually flexible machine that can be used for routing, shaping and carving wood, metal or plastics. Combines high speed $\{20,000\ R.P.M.\}$ power $\{1200\ watts$ at the spindle) and solid, heavy construction that gives smooth, vibrationless cutting. Is extremely flexible—can be transformed quickly into a Shaper or Carver. Standard equipment handles 1/4'', 5/16'' and 3/8'' bits for routing—5/16'' and 1/2'' bare shaper cutters—and all standard cutters for carving. Has many special features including: Specially designed G. E. Universal Motors, New Departure Precision ball bearings, precision machining throughout; Table can be instantly adjusted to any height without holding foot pedal. Chuck is part of spindle and holds adaptor and cutter close to work, thus preventing whip. Many other exclusive features. Unusually low priced.

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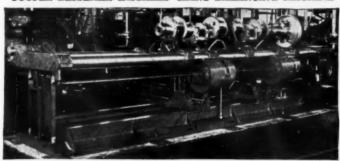
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Sous Talk Shop

COOPER-BESSEMER INSTALLS GIANT BALANCING MACHINE



A GIANT-SIZED dynamic balancing machine equipped with dual compensators so that corrections may be indicated both as to exact angle and amount in any two pre-determined correction planes, has been installed by The Cooper-Bessemer Corp., Mount Vernon, Ohio in its Grove City, Pa., plant to bring about still greater precision in the manufacture of its Diesel crankshafts.

The machine, believed to be one of the largest in operation is capable of handling the company's JS-8 shafts which have bearings up to 9" diameter and which weigh as much as 5,800 pounds and are up to 157%" in length.

(Continued on page 292)

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Requires fewer passes across the wheel.

Generally used with fast dressing traverse.

"Experts agree they are the best on the market."



According to the Tinius Olsen Testing Machine Co., Philadelphia, which manufactured the machine to Cooper-Bessemer requirements, the use of the dual compensators is a new feature which does away with any calibration whatever by giving a direct reading to the exact amount of unbalance at the two points of correction. The compensators remain set after readings are taken, thus revealing to the operator after machine is stopped exactly where and how much correction is to be applied to obtain balance.

Another interesting feature of the new balancer is application of a center support roller with hold down bracket to keep the long crankshafts or other long rotating parts in perfect alignment during balancing operation. This eliminates possibility of whipping at high speed and does not affect unbalance readings in either end of the shafts. Most machines of this kind are so constructed as to make this third support impossible, according to the manufacturer.

Cooper-Bessemer has made extensive tests with the new balancing machine on its forged and cast crankshafts and its engineers predict that combined with recent improvements in bearing design, greater precision than ever before will now be possible in the manufacture of engines ranging from 135 to 1200 hp.

TURNING BOLTS



A head stock spindle, designed and developed at General Electric's Pittsfield Works, is particularly suitable for turn-

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Type is easily, quickly, loaded and unloaded.

Simplest construction,
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in various sizes;
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ing large bolts of the body-bound type. Thru its use, both in and out of the lathe, handling time has been reduced 50 per cent.

Both ends of the bolts are centered, and when they are placed in the lathe, a drive force is obtained by contact with two %-16 setscrews. Regardless of how the bolts are turned, it is necessary to center both ends for grinding purposes, thus, there is no additional expense. Since this new method eliminates the slow, conventional method of holding the bolts in a chuck, production is increased.

MO-MAX HANDBOOK

The new Fifth Edition of the Mo-Max Handbook, prepared by J. V. Emmons, Metallurgist for The Cleveland Twist Drill Co., is now available for distribution. Included among its contents are details on the standard and special analyses of Mo-Max . . brief instructions on forging, annealing, hardening, quenching, tempering . . . the new sub-zero treatments . . . tool performance . . . comparison of microstructures of Mo-Max and 18-4-1 high speed steels . . Rockwell hardness curves and other informative charts.

Copies may be obtained free of charge by addressing The Cleveland Twist Drill Co., 1248 East 49th St., Cleveland 14, Ohio. (Department P)

FLY CUTTING MAGNESIUM CASTINGS

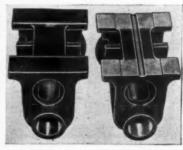


Fig. 1 shows a machined and unmachined base of a magnesium casting. This machining was originally done in two operations using conventional milling cutters which had been ground for milling magnesium.

In order to obtain more production from the available milling machines, a



A tool that saves time is a great contribution to the safety of this nation. A tool that saves money is a safeguard against non-profit and loss to your shop. R and L is just such a tool.

Speed is the keynote of this vast defense production schedule. This Turning Tool increases production by reducing set-up time, by speeding up cutting, by doing right and left hand turning (it requires only ten seconds to change from a right to a left hand turning tool), and by performing several operations simultaneously.

A savings of over \$200 is realized on the initial cost alone. R and L costs less than one-fourth of the tool which it replaces (14 in all). And, because they are simply and ruggedly built, they retain their accuracy, thereby saving maintenance costs. It does away with the reconditioning of extra tools when worn, or replacing when lost.

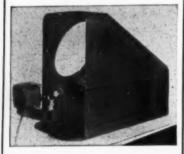
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instead of special expensive gages on your tough inspection jobs.

This simple Optical Projector offers unusual versatility so that awkward jobs—difficult to check by other means can be quickly set up on the projector and checked visually.

For fast, economical, accurate visual inspection, the NEW Portman (MODEL P2.5) can be relied upon—and in many instances this Projector will substitute for a lot of expensive gages. The price is only \$175.00 complete. Compare this with your present gage costs.

Practically immediate delivery.

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PORTMAN MACHINE TOOL CO.

holder was designed to hold three tungsten carbide tipped cutting tools which now replace the milling cutters for machining the base and groove.

The pads, clearance and groove are now fly cut in one operation to increase the productivity of the milling machines by approximately 60%.

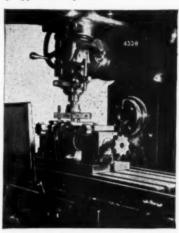


Fig. 2 shows the fly cutting attachment to the milling machine head set up in operating position.

By A. Nicholson, Westinghouse Electric & Mfg. Co., East Springfield, Mass.

RIVET SORTER

Made entirely of scrap is an ingenious new rivet sorting machine built by three employees of The Glenn L. Martin Co., Baltimore, Md. Its construction is a perfect example of "necessity being the mother of invention."

With the arrival of a new Martin plane contract came a new type of countersunk-rivet, having a 100° head. Most rivets used prior to this time were of the 115° head type. Rivet sorting machines already in operation would not separate the 100° from the 115°. The sorting operations could be carried to the point where these two types reached the same boxes, but from this point on the rivets had to be hand sorted.

Hours spent in the hand operation were many, the volume of rivets separat-



Photo above shows lefterson Turrets on 16" lathe



71/2" Swivel Base Dividing Head - In Stock IMMEDIATE DELIVERY No Priority Required

Convert

YOUR ENGINE LATHE INTO A TURRET LATHE IN 15 SECONDS

Yes, it's as easy as that!
You simply attach the
Jafferson Tail-Stock Turret, the Jefferson
Tool-Post Turret, and the Jefferson Adjustable Pull Feed to your lathes as shown in illustration.

The productive capacity of these machines will be more than doubled in many instances because there will be available at all times NINE DIFFERENT TOOLS.

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ASK FOR BULLETIN 24-1

Janette Manufacturing Company 556 W Monroe St. Chicago 6. 111

ed was small and even more disturbing was the fact that the most careful workers were unable to make a perfect segregation, which resulted in mixed stocks and the possibility of improper rivets reaching the assembly floor.

The designers and builders constructed their new machine with an inclined screen which oscillates 140 times per minute. The separating screen is made from a piece of sheet steel, punched full of holes of a certain diameter.

In actual operation, the 100° rivet heads are a few thousandths of an inch smaller and pass thru the screen while the 115° rivets remain on the top of the screen, even tho they are of the same shank diameter.



By simply pulling two pins, the entire screen can be removed and replaced with a screen having holes of a different diameter which allows for sorting of other special jobs such as nuts, washers, screws, etc.

Frame for the new device was made from short pieces of scrap angle iron, the screens from scrap wood and small sheets of scrap sheet steel into which holes have been punched by a punch press; the handles were fashioned from scrap clamps, the feed chute and hopper from scrap aluminum and the auxiliary chute



Unretouched photograph of the 2-inch Maximum Capacity chuck holding down. 5 horsepower, taking a cut ½ inch deep with carbide tool. One inch Maximum Capacity chucks have comparable performance records.

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Round, hexagon or square collets, plain or serrated, are available from stock or on special orders.

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- INSTANT GRIP OR RELEASE without stopping the lathe. Customers claim our chuck pays for itself in one week.
- AUTOMATIC ADJUSTMENT: holds stock varying as much as .007 over or under stock size.
- THIS PUSH-OUT TYPE CHUCK insures accurate length because it pushes the stock out against the stop while locking.
- NO HEAT—FRICTION—CHAT-TER—OR LOST POWER because there are no bearings. All moving parts turn at spindle speed.

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With the production machines of the nation humming on toward another Victory, still more pieces and parts must be counted . . . on some it will be revolutions . . . on others turning out materials, the count must be measured in feet or yards. Whatever it is, you can depend on

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to give you the exact count . . . and at the same time, provide you with vital information on each machine . . . whether it is running to full capacity, keeping up with production schedules, when it needs servicing. They're built for hard usage . . varying speeds . . their performance is guaranteed.

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from salvaged galvanized iron. Even the brush which is used to keep the rivets from packing around the chute opening was once a scrap item.

Chief saving possible thru use of the machine is elimination of hand sorting which proved inaccurate. Tests also have shown it to be 20 times faster than the hand-sorting method formerly used, and it is estimated that during the present year it will save more than 20,000 manhours.



ROTOR PACKS POWER OF HOW-ITZER—Poised as tho for firing, this giant "howitzer" is actually a rotor for a 30,000 kilowatt waterwheel generator being manufactured by the Westinghouse Electric & Mfg. Co. Weighing 92 tons, the rotor will spin around at the rate of 600 times a minute to produce electric power for war plants and homes. It will form part of the second largest high-speed generator built in America, revolving six times as fast as the huge waterwheel generators at Grand Coulec Dam. When completed, the 190-ton generator will supply electric power sufficient to light 500,000 regular 60-watt Mazda lamps—illumination enough for a city the size of Cincinnati.

BROACHING MANUAL

A new "Manual of Broaching", described as the most comprehensive book on broaching ever written, has just been published by the Detroit Broach Co., 20201 Sherwood Ave., Detroit 12, Mich. It is printed in two colors and contains 8 pages of information of interest to



CUTTING-OFF

Made of Cobali

MEY POSSESS all the distinctive features of Empire's standard high speed steel cutting-off blades—but being made of cobalt, they have that extra stamina that enables them to take extra hard punishment. They have extreme strength with high wear resistance. They are the "toughies"-used where speeds and feeds are beyond the ability of regular blades to "take it"-where the abnormal heat created breaks down the cutting edge.

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Blades are held in holders especially designed for any standard hand or automatic screw machines, or other applications.

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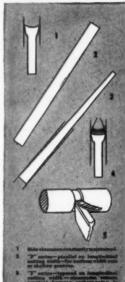
Our engineers (located in principal cities) will gladly call at your plant to assist you in simplifying your cutting-off operations.

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equipment including broach sharpening.
Copies of the "Manual of Broaching"
are available from Detroit Broach Co., at
a price of \$1.50 per copy.

"PUTTING SCRAP TO WORK"

Furthering its "putting scrap to work" activity, The Glenn L. Martin Co., Baltimore, has discovered a new use for cor-rugated steel scrap strips. Employees in the Finishing and Plating Department are now using them in various widths and corrugation dimensions to hold small parts while they are being painted in the automatic sprayers and on the hand sprayer racks.



Making the strips available in many sizes prevents even the smallest of parts from being blown out of line by the force of the spray as was the case when fine mesh screen racks were used. The new method also proves more satisfactory than the gummed tape method because it holds parts with curved surfaces more securely than does the tape.

The new method results in considerable time-saving in moving the parts to

W-J QUICK CHANGE STANDARDIZED SYSTEM LATHE TOOLING



Angular Tool Holder (Comb. Turning and Threading)

Parting or Cut-off Tool Holder



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Facing or End Forming Tool Holder



Modernize Your Engine Lathes

Special Adapter Base

Many different operations are performed quickly on engine lathes equipped with K-J Quick Change Lathe Tools. Tools are changed in 3 seconds, with assurance of instant positioning and accurate repeating. Fine height adjustment Rigid tool holders (no live joints) take any load, have 50% less overhang. Perfect for cemented carbide cutters, prolong all tool life.

Available, in addition to the tools shown here, are Chaser and other holders for almost any operation on any standard engine lathe of any size. For maintenance, tool room and production, speed up work and economize with K-J Quick Change Standardized Lathe Tooling Write today for Bulletin "A"



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the drying racks, plus the fact that the strips can be used for many operations before cleaning becomes necessary. It also eliminates the cost of gummed tape which was used prior to this time.



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Simonds Worden White Co., Dayton, Ohio, in continuous operation for 73

IMMEDIATE DELIVERY

3,000 New Steel Stacking Boxes



Illustration Shows bexes Stacked 3 High

Well constructed

\$2.00 each, F.O.B. Chicago

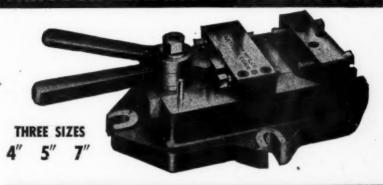
24"x15"x7½—18 gauge. Drop handles both ends. Lots of 25 or more.

PASSMAN BROTHERS

1101 W. Lake St.

Chicago 7, III.

NOW NATIONALLY DISTRIBUTED THROUGH LEADING SUPPLY HOUSES



FENN QUICK-ACTION VISE

A partial list of suppliers who are prepared to give you special service. If your territory is not listed write direct.

Dillon Supply Company Raleigh, North Carolina The Globe Machinery & Supply Co. Des Moines, Iowa

The Hardware & Supply Company Akron, Ohio

The Jennison Hardware Company Bay City, Michigan Kasper & Koetzle, Inc. Brooklyn 6, New York

Lafayette Tool & Supply Company New York 13, N. Y.

Langdon Supply Company Kansas City 7, Missouri Lewis Supply Company Memphis, Tennessee

The C. S. Mersick & Company New Haven 7, Conn. Mill & Factory Supply Co. Toledo, Ohio

The National Machine Tool & Supply Co.
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C. T. Patterson Company, Inc. New Orleans 7, Louisiana Peden Iron & Steel Company Houston 1, Texas

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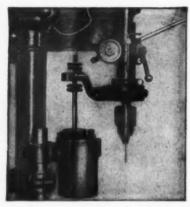
CANADA Northwest Industries Limited

Edmonton, Alberta Rudel Machinery Co., Limited Montreal - Toronto - Windsor

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

"Reaming gun part, reduced scrap loss over 90%"

COPILOT DRILL PRESS FEED REGULATOR



Enables totally inexperienced and unskilled operators to produce good work from the start . . .

Prevents violent contact of drill with work at start of operation.

. . . permits maximum production . . . climinates unnecessary drill breakage . . . controls break-through.

Horizontal model controls difficult hand miller jobs.

For full details write immediately to Special Devices Co., 758 Farmington Avenue, Berlin, Conn.

Special Devices

years, announces development of a nondeforming flat ground stock, now available to assure high accuracy in jigs, gages, fixtures, tools, punch and die facings and small precision parts. It is emphasized that this high quality steel, known as "Air-Tru", offers real economy in time and money on precision work, eliminating more than 75 per cent of deformity.

A new illustrated folder is available on request. It shows the marked superiority of this type of steel in holding close tolerance thru heat treating

tolerances thru heat treating.
"Air-Tru" flat ground stock is available in all standard stock sizes.

MACHINE CENTERS

A stock tool bulletin (No. 137) describing its line of carbide tipped machine centers. has been published by Tungsten Carbide Tool Co., 2661 Joy Road, Detroit 6, Mich. These centers are listed in Morse Taper Numbers 1 thru 5; in B. & S. Taper Numbers 7 thru 11; and in Jarno Taper Numbers 4 thru 12. Such popular sizes as Morse Taper Numbers 2, 3 and 4; B. & S. Taper Numbers 7, 9, and 10; and Jarno Taper Number 6 are carried in stock ready for immediate shipment. All of the centers listed in the bulletin are tipped with Carboloy Grade 44A carbide.

CUT SET-UP TIME

75% WITH THE USE OF ADVANCE T-SLOT CLAMPS Speed-Accuracy-Economy-Safety

The only T-slot clamp made. Clamps directly over work. For use on all machines with T-Slots, Standard, Heavy Duty and Angle Types.



Send letterhead for catalog

ADVANCE MACHINE WORKS 3727 Weisser Park, Ft. Wayne 5, Ind. When Safety Is A Requisite



CHICAGO "SAFETY PLUS" SOCKET SET SCREWS provide that safety

Socket Set Screws were conceived for the purpose of safety—safety for machine operators from protruding set screws in rotating machinery. Chicago "Safety Plus" Cup Point Socket Set Screws cut their own seats, embed themselves securely wherever applied, and are particularly desired as the means for holding in fixed relation such parts as are subject to severe vibration and extremely high revolutions per minute . . . These products have sharp full threads of uniform pitch diameter, clean, true sockets, strength, toughness and hardness . . . The complete line includes Cup Point, Half Dog Point, Oval Point, Flat Point, and Cone Point Socket Set Screws.



These Fine Products are sold only thru Authorised Distributors



THE CHICAGO SCREW CO.

ESTABLISHED 1872

1026 SO. HOMAN AVENUE

CHICAGO 24, ILL.



"In order to tap perfect threads and prevent taps from breaking or wearing lop-sided, the tap and the hole must be in perfect alignment.

"This alignment is called concentricity and concentricity has come to be known as synonymous with ALCO Tap Holders.

"All of the ALCO Drill Chucks, Tap Holders, Die Holders, Hollow Mill Holders, and Roller Stops and Supports have the exclusive floating feature which makes concentric alignment such a simple operation when you are setting up.

"First of all, you don't have to requisition out bushings for the various sizes of taps because the ALCO Tap Holder keeps a firm grip on the tap in its rugged jaws—no slipping in this holder. And when the tap is all tight in the holder, just center it in the hole and tighten down those two studs to keep it concentric. See how much lost motion you save, and it doesn't take a mathematicien to show you how much time you save when setting up.

"Then, with every cutting edge of the tap doing the same amount of work, it's a cinch to see that the tap won't break, that it will last longer because of the even wear, and the threads it cuts are going to be perfect.

"Even on our old machines, this concentric alignment feature helps overcome the imperfections in work produced,"

ALCC-FOOLS

THE ALCO TOOL CO., 252 Birdseye St., Bridgeport, Conn.
908 Stephenson Bldg., Detroit, Ph. Mad. 5870
608 S. Dearborn St., Chicago, Ph. Web. 2868



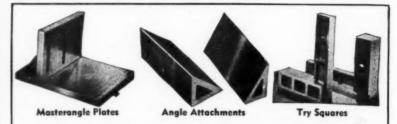


GETCO TOOL COMPANY

CARBIDE SPECIAL CUTTING TOOLS HI-SPEED 15541 PLYMOUTH RD., DETROIT 27, MICH.

-VERMONT 7-1770-

SOMETHING NEW HAS BEEN ADDED TO OUR LINE OF MEEHANITE METAL PRODUCTS





Write for Literature

ACME TOOL COMPANY

200 CHURCH STREET NEW YORK 13, N. Y.

the cost. LESS EFFORT · LESS MAN HOURS Mansen Fush-Tite air nose couplings are savers on any production line. They save many steps in a day, much time and effort, and a considerable volume of air, which all adds and effort, and a considerable volume of air. and effort, and a considerable volume of air, which all adds up to greater production, less cost, and more profits. There is up to greater production, less cost, and more proms. There is no shorter cut or better way to meet tomorrow's keen compe no shorter cut or better way to meet tomorrow's keen compe-tition than to conserve and save all the way along the production thron man to conserve and save an the way line with Hansen Push Tite air hose couplings. They're simple and easy to operate: slight push of plug into socket, it's connected, locked and air is automatically turned on. To disconnect, merely slide sleeve back with thumb, plug is ejected and air is automatically turned off instantly. No loss of time, air or effort, no twisting or turning to connect or disconnect. You can't afford to be without Hansen couplings because they pay for themselves on savings and increased production. There's a Hansen coupling made for air, oil. grease, gasoline, oxygen, and acetylene. Our free industrial catalog is yours for the asking ... send for it today. and Keek 9t! THE HANSEN MFG. CO. 1786 EAST 27th STREET CLEVELAND 14, OHIO

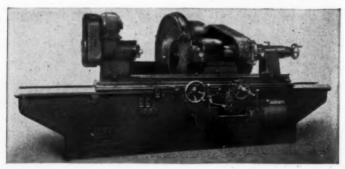
WHAT'S NEW IN METALWORKING

NORTON AUTOPART AND CRANK-SHAFT REGRINDING MACHINE

A NEW Autopart and Crankshaft Regrinding Machine in sizes of 22 x 72" and 24 x 84" is announced by Norton Co., Worcester, Mass. The machine has been designed for the regrinding of crankshaft pins and bearings on automotive, tractor, Diesel and truck shafts. It is adaptable for use in any machine or inching, shop

for use in any machine or jobbing shop. Features of the machine include headstock and footstock with antifriction spindle, with an adjustable work holder mounted on each of these spindles. These work holders have been applied to numerous machines of different sizes and have been very successful. They have a broader range than a jaw chuck and retain their accuracy indefinitely. When grinding crankpins, the shaft is held on the end main bearings affording greatest possible accuracy and rigidity for this operation. Compensation may be made for any wear occurring in the work holders over a period of years by means of an adjustment which has been provided in its construction.





If it's a small part

. turn it with Precision, Speed and Profit

on a

SHELDON



Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. The lathe selected by U. S. Army, the Navy and the Marine Corps, for mechanized machine shop instrument repair shops, etc.).

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

All SHELDON lead screws are cut on the finest Pratt & Whitney "Super-precision" lead screw machine. BUILDERS of GOOD LATHES since 1919

- Bronze or anti-friction bearings
- · "1" Collet capacity
- · 111/4-inch swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
 Underneath V-Belt mo-
- Underneath V-Belt motor drive.
- · All Steel Bench

SHELDON MACHINE CO., INC., 4242 N. Knox Ave., Chicago 41, U.S.A.

Why Bother

WITH A MULTITUDE ?

MANDRELS

does the work of 209 SOLID ARBORS



TYPE A-STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

| Size No. | Range of Bores Taken | Length Overal | |
|----------|-------------------------|---------------|--|
| IA | 1/2" to 1" | 9" | |
| 2A | 1" to 11/2" | 11" | |
| SA | 192 10 2 | 121/4 | |
| 5.4 | 2" 10 3" | 20/2 | |



TYPE B-STRAIGHT JAW DESIGN

Adapted for work with both short and long bores:

| Size No. | Range of Bores Taken | Length Overall |
|----------|-------------------------|----------------|
| IX | 1/2" to 18" | 5" |
| 3X | 21/32" to 34" | 8m |
| 00 | %4" to %" | 81/4 |
| i | 1" to 11/4 | 9" |
| 2 | 114" to 1-6 | 1134" |
| 3 | 2" to 21/4 | 171/419 |

(Other sizes taking up to 7" bores.)

Sold singly or in sets. Prompt delivery. Bulletin 1043.

W. H. NICHOLSON & CO.

A distinctive new Norton unit is the work locator and steadyrest. The locator indicates the position of the crankpin, both for throw and plane showing the amount of adjustment necessary. The hand wheel on the steadyrest, graduated in thousandths, is used to make the necessary corrections for out-of-plane conditions. Adjustments for throw are similarly made with graduated screws in the work holders. This indicator can also be used for a grinding gage to indicate size as compared to a pre-established standard, or to show the amount obstock being removed.

The machine is so designed that both crankpins and bearings can be ground with a minimum expenditure of time for set-up between operations. Also a quick changeover can be made from one size crankshaft to another.

HY-DRAULIC SLOTTERS

Hy-Draulic slotters are available in two sizes with 12" and 20" strokes, respectively. Offering the advantages of hydraulic ram-drive and hydraulic feeds, they are precise, unusually massive, powerful and fast. The two sizes are alike in all details except stroke length, height, and similar related factors.



In addition to hydraulic ram-drive, manual and hydraulic longitudinal and



SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate ideal for small tool and die shops—saves time these five different ways:

- Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
- 2 Saves time and expense of drawing or tempering small metal parts in large furnaces.
- 3 Cuts handling time when normalizing or annealing small parts. No waiting.
- Conveniently available for pre-heating for subsequent high-speed hardening.
- 5 Eliminates shut downs and delays in servicing emergency repair orders.

AVAILABLE IN TWO SIZES

| Type | Chamber Capacity | Amps 115 V | Watts | Amps 230 V | Price | |
|------|------------------|---------------|-------|---------------|-----------|--|
| MH-3 | 8"W 6"H 14"L | 29.6 | 3400 | 14.8 | \$124.00° | |
| MH-4 | 10"W 6"H 18"L | | 4800 | 20.9 | \$191.00° | |

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—\$152.40.



REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refactory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, addi-

tional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.



COOLEY ELECTRIC MANUFACTURING CORP.
36 SOUTH SHELBY STREET . INDIANAPOLIS 7, IND.

transverse feeds with rapid power traverse are provided. The table has manual and hydraulic rotary feeds with rapid power traverse. Micrometer dials, graduated in thousands of an inch are provided for longitudinal and transverse feeds. The table is graduated thru 360°.

The 12" stroke model has 18" minimum space under ram guide and an adjustment of 15" in positioning ram on its hydraulic driver.

The 20" stroke size has 24" space under ram guide and an adjustment of 19" in positioning ram on its hydraulic driver.

Both sizes slot to the center of a 48" circle, have cutting speeds infinitely variable between 10 feet a minute and 60 feet a minute, return speed 1.67 times cutting speed and take tools up to \(\frac{1}{2} \)"

Hydraulic feed to table is infinitely adjustable between 0 and 0.106" per cutting stroke for transverse movements, between 0 and 0.053" for longitudinal movement and between 0 and 0.111" on a circle "diameter, for circular movement. Many additional details are given in a new 8-page bulletin, form No. 447, available from Rockford Machine Tool Co., Rockford, Ill.

CRUSH DRESSING DEVICE



The Sheffield Corp., Dayton, Ohio has developed a powered crush dressing device for use with Model "B" Thompson Surface Grinder. It is mounted on the wheel head slide as shown. A 1/3 hp



Whether for war or peacetime production, the quality of your product is dependent upon the use of reliable controls. MASTER GAUGES are recognized by the leaders in the industrial field as being instruments of exceptional durability and precision.

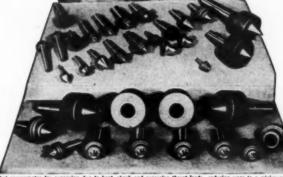
THREAD PLUGS THREAD RINGS PLAIN PLUGS PLAIN RINGS SNAP FLUSH PIN PROFILE BUILD-UP THREAD CONCENTRICITY JIGS, DIES AND FIXTURES



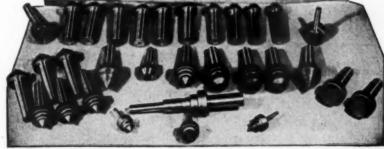
2210 Fenkell Ave. Detroit 21, Mich. Phone: University 3-7676



Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action . . .



that compensates for expansion due to heat, shock and excessive thrust leads—reducing wear to a minimum. A properly engineered live center is one of the fundamentals of setting up a job and requirize a specialist's experience — standard shanks with Mersa taper carried in stock.



Send us your specifications and blueprints—We will see that your job is set up with the right LIVE CENTER—prompt deliveries on high priorities.

STURDIMATIC TOOL COMPANY

gear head motor, not shown, is directly coupled to a grinding wheel spindle at rear of the housing. This drives the wheel at crushing speed thru an overrunning clutch, which is thrown out of engagement when actually grinding.

In applying crush dressing, the preferred method is to have the grinding wheel revolve the crusher roll. This calls for some means of driving grinding wheel at reduced speed, as crush dressing is only successful with lower surface speeds. It is also necessary to have crushing device located with respect to grinding wheel spindle so that the axes of both crusher and wheel spindles are absolutely parallel.

While these requirements can be obtained by having crushing device mounted on table of the surface grinder and using a separate motor to revolve grinding wheel at crushing speed, it is not desirable to have crusher roll in the way of the work nor to allow it to be subject to abrasive action of the coolant, which is charged with wheel grit and metal particles. The best means of applying crush dressing to surface grinders, is by mounting crushing device on wheel head slide, keeping crusher roll out of the path of the coolant.



An important feature of this new Sheffield device is feeding crusher into wheel by means of an electric motor, which turns the micrometer in-feed

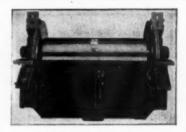
IF YOU WERE TO WRITE THE SPECIFICATIONS

Chances are, your ideas of a heavy duty stand snagger come pretty close to the Marschke Vari-Speed Grinder specifications.

Your overall expectation would be "maximum metal removal with minimum wheel wear" and to this end your first demand would be, gradual spindle speed variation, to get constant wheel rim speed for all stages of wheel wear.

Secondly you'd want a lot of power. You would call for a stiff spindle with accurately fitted flanges and large bearings to assure smooth wheel rotation along with the power.

Even these basic requirements wouldn't satisfy unless there were conveniently adjustable. rugged work rests, safe wheel quards, efficient exhaust and clean-outs.



Of course you would also specify size and mass of base to absorb the tremendous forces resulting from impact between castings and $24^{\prime\prime}$ or $30^{\prime\prime}$ wheels driven by a 25 to 40 HP motor.

You know that such a machine soon pays for itself — and we know that the MARSCHKE VARI-SPEED GRINDER is just such a machine. To get the details ask for Marschke Bulletin No. 51. Write

VONNEGUT MOULDER CORPORATION

1805 MADISON AVENUE

INDIANAPOLIS 2, INDIANA

Quick way to STOP DUST!



DUSTKOP SELF-CONTAINED DUST COLLECTORS

MODEL 600

DUSTKOPS are installed in a few minutes. Flexible metal hose makes slip fit with dust outlets on grinder.

MODEL 950

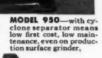
This unit, with dust hoods, "ready to go," fits any double-end pedestal grinder not already equipped with wheel guards and dust outlets.

DUST STOPPED ON ALL ABRASIVE OPERATIONS AT LOWEST COST

For quick, economical, effective,dust control at the source, install DUSTKOPS. Easy to attach to surface grinders, discribers, discribers, sucter and tool grinders, cutter and tool grinders, extremely suffers, sanders and abrasivecut-offs—whether single or multiple units. Large or small models available.

DUSTKOPS are compact and portable. Entirely self contained, with motor, fan, cyclone separator (in all but amallest models) and spun glass filter. Flexible metal hose permits quick installation.

DUSTKOPS clean the dustladen air without wasting heat. Efficient cyclone separator provides low maintenance. Many other features make DUST-KOPS ideal for your shop or laboratory. Immediate shipment of "standard" voltage



(Left)

MODEL 1250—one unit handles dust from four wheels.



With flat, spun glass filter for compact bench installation. Pulls all dust from two grinder wheels.



MODEL 950—has cyclone separator, plus spun glass filter. For medium duty work of all kinds,



MODEL 1250 gets all dust and smoke from this heavy duty abrasive cut-off, at extremely low cost.



AGET-DETROIT COMPANY

605 First National Building . Ann Arbor, Michigan

Detroit Office: Tel. CAdillac 3090

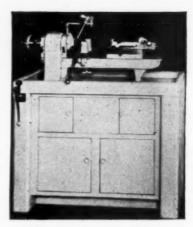
screw at a constant rate. A close-up is shown.

There are two styles available. Model "B" is semi-automatic with feed dial indicator preset for a desired depth of automatic in-feed of crusher roll. With Model "A", operator controls the device by pressing a push button and releasing pressure when feed indicator dial shows desired depth has been reached.

Advantages of the power crushing device over manual crushing are said to include 50 percent reduction of dressing time, increased crusher roll life, longer wheel life and more parts per dressing because wheel is always formed under identical conditions of in-feed and pressure. Model "B" has the additional advantage of keeping amount of stock removed from wheel to a minimum, as the human element is entirely removed from the actual wheel dressing operation.

NO. 7 SCREW MACHINE

A new No. 7 Precision Screw Machine Unit mounted on a metal cabinet has been developed by the Wade Tool Co., Waitham, 54, Mass. The collet capacity can be either ¾" or 1", and the turret takes tools with ¾" shank. The turret not only indexes automatically, but is self-clamping. The turret slide has taper gibs



so that alignment cannot be impaired. An exclusive arrangement of ball, thrust, and roller spindle bearings is said to give rigidity and freedom from vibration at high speeds.



Send for catalog of small tools and machinery.

TRAVERS TOOL COMPANY

5 COURT SQUARE

LONG ISLAND CITY, NEW YORK



DETROIT STAMPING CO. 347 Midland Ave . Detroit 3, Mich.



A HARD HITTING

FOR

IGHTY BUT GENTLE-NUPLA HAMMER uses a new plastic discovery called "Flex-O-Cryst," a semi-soft flexile material that HEALS IT-SELF when dented or deformed. NUPLA Hammer hits hard effective blows without cutting or damaging delicate parts or finishes. More durable than rawbide because it does not curl or permanently deform, Unlike rubber, will not rebound: not affected by oil or gasoline. Will not support combustion or explode. Will not chip or crack.

> Every skilled craftsman wants and needs a Nupla Hammer.

3 sizes and 7 weights SOLD AT HARDWARE STORES EVERYWHERE: write for name of local dealer.

NEW PLASTIC CORPORATION 1017 N. Sycamore Los Angeles 38, Cal.

MIGHTY
but Gentle

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PLASTIC
HAMMERS

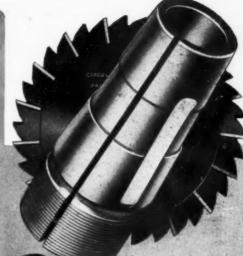




Side Chip Saw



Staggered Teeth Saw



Metal Slitting Saws MAJORITY OF SIZES

VAILABLE FOR IMMEDIATE DELIVERY!

Slitting a surface grinder front spindle bearing (shown above) is only one of countless operations performed by these

Circle R saws.
The Circle R side cut slitting saw is designed to take deep cuts, split chips and eliminate dragging while the Circle R Slifting Saw, with staggered teeth, is for use where deep cuts or heavier feeds are required. The shearing action of

the peripheral teeth and more chip clearance on the sides give

this latter saw on advantage over the regular side chip clearence.

For complete details and specifications on these and other Circular Saws, sone for Catalog K.



® CIRCULAR TOOL CO., Inc. ®

PROVIDENCE 5, R. I.

DETROIT . ST. LOUIS

Use the COMBINATION DRILL TABLE and VISE



SPEEDS DRILL PRESS SET-UPS

Simplifies the most difficult set-ups. Holds work of all shapes securely, without angle plates, clamps or supports. Just drop in the work and start to drill.

The Combination is made in various sizes — diameters from 8" to 27½", weighing from 27 to 600 lbs. Made of the finest materials, for long life. Easy to install. Specify shank diameter in thousandths of an inch. We supply the drill table and vise with shank turned to size specified.

GUARANTEE

We guarantee the Combination will save its cost in labor alone in six months. You are the judge.

FREE TRIAL

We will ship to rated concerns under this guarantee, on free trial. Should you decide not to keep the tool we will even pay return transportation. Order Today!

Circular on Request.



Gives full information and illustrates typical, set-ups. Shows use on radial drills. Complete specifications of all models including the square, all steel tables.

MODERN MACHINE TOOL CO.

Jackson, Michigan

FOR LIGHT DRILL PRESSES

A MORE EFFICIENT TAPPING HEAD!

This special cover clamping Model Procunier Tapping Head has been developed for most light drill presses. Removes weight of tapping head from bearings and drill pross spindle. Rigid and accurate mounting is secured with fittings which clamp directly around the press quill. Other advantages include no overhang, no tap wobble, langer tap life, less tap breakage, and greater accuracy. Easily attached and removed. Thousands of shops report unusual production records with Procunier because these remarkable heads are built to stand under the toughest production grind. The exclusive advanced design of the new Procunier Tapping Heads assures you accurate tapping at high speeds with auto-

matic protection for taps! Tap is driven by a double-cone, ork-faced friction clutch which automatically regulates tap driving power by pressure a pplie de through the driven can quickly detect full or loaded taps by the "feel" or pressure on the clutch, required to drive them, the clutch, required to drive them, the clutch, required to drive them, the sensitive Procuniers moot to operating friction clutch, bottom tapping is as simple as through tapping, since the clutch instantly slips should the tap strike bottom or stick due to tap loading.



PROCUNIER

SAFETY CHUCK CO.

14 S. Clinton St. CHICAGO 3, ILL.

Send for Bulletin

giving full details, description and prices on complete line of Procunier Precision Tapping Heads to meet all needs. The new Tru-Grip Tap Holder and also the full line of Procunier Universal Tapping Machines,

PROCUNIER SAFETY CHUCK CO., 14 S. Clinton St., Chicago 3, III.

Send me bulletins on:

High Speed Tapping Heads Tru-Grip Tap Holders

Universal Tapping Machines.

| Actine | *************************************** |
|--------|---|
| Addres | s , |
| | |

NEWTON BAR FEED

A new bar feed is announced by the Newton Mfg. Co., 215 W. 7th St., Los Angeles 14, Cal.

Made in seven sizes to take bar stock from 6' to 11' lengths, the Newton bar feed is a complete unit ready for use, including stands, seamless tube, pressure regulator and piston.

The airline connects to the pressure regulator, which delivers the desired pressure to the far end of the stock tube

and actuates the piston, which pushes stock into the lathe and against the stock stop under uniform pressure. Length rejections caused by the variations of pressure inherent in mechanical and hand-feeding of stock are thus eliminated. The pressure regulator, in full sight of operator at all times, is quickly adjusted for various stock weights. Only a small amount of line pressure is necessary for stock feed; as, for example: 4 lbs pressure feeds ¼" diameter by 8" stock.

Noiseless stock feeding is said to be accomplished by the piston, the forward end of which is of inverted cone shape



mounted on end-thrust ball bearings, centers the stock and turns with it, there-by holding it away from feeder tube. The piston has carbon-impregnated Neoprene rubber rings which seldom require renewal in order to retain satisfactory air pressure in the feeder tube,

TOOL BIT SELECTION

A new folder containing useful information on tool bit selection has just been prepared by the Carpenter Steel Co., Reading, Pa. It is available on request to tool engineers, machinists, and metal workers.



4114 North Knox Avenu Dept. Y-645 CHICAGO 41, ILL. SAVE TIME and THE USE of EXPENSIVE EQUIPMENT for

KEYWAY CUTTING...

The

GLENNY adjustable-expansion
Push BROACH

ON YOUR ARBOR PRESS WILL CUT KEYWAYS

THAN A SHAPER

Factories everywhere are replacing many keyway and slotting operations with the Glenny Broach on an Arbor Press or other tool. They report savings of 10 times—or better, with every piece accurate to ±.0005.

One Keyway or Quantity Production



ACCURACY OF ±.000

Whether an occasional keyway or slot, or quantities, the Glenny Broach will save production time and costs.



FOR BULLETIN

14" keyway,
14" deep in
Aluminum
Steeve. A quantity production
operation.

Patent No. 2,184,383

½" keyway, ¼" deep in Bronze Bushing. An important operation for Plane production.

DEPT. A, EAST SHORE MACHINE PRODUCTS CO.

835 EAST 140th STREET

CLEVELAND 10, OHIO, U. S. A.

The folder shows the type of bit to use for various types of work such as intermittent cutting; fast, continuous cutting, fine finishing, and hogging or rough turning operations.

This folder on the proper selection and use of tool bits is an aid in lengthening tool life and stepping-up output per grind.

TURRET CROSS-SLIDE

A cross-slide attachment designed for grooving, forming, cutoff and similar operations has been developed by Alameda Mfg. Co., 4415 S. Alameda St., Los Angeles, Calif. Adaptable to any lathe turret, manually operated from turret position this device provides for extremely close tolerances without chatter. Standard size unit handles any material from 1/16" to %" diameter and up to 2½" in length.

The makers emphasize that the crossslide will increase rate of production and accuracy; is quick and simple to set-up; maintains uniformity and requires no skill to operate.

Made of machine steel, heat treated and ground for precision and durability, means are provided for adjusting hardened and ground steel "V" rest blocks for various sizes of stock or for longitudinal position and for adjusting forward





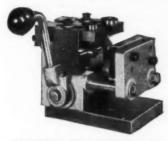
• GUILD is the new name for an old established line of reamers whose reputation for accuracy has becomeoutstandingin the manufacture of aircraft-motors-engines-small armsradios - fine instruments, etc. The name GUILD is stamped on each individual reamer as an identification-a hallmark of finest quality. Quality that is possible only by creative and productive ability far above the average in the manufacture of reamers specially built for special purposes. Write for booklet.

METAL CUTTING TOOLS AND MANUFACTURING CO. 11121 Grand River Ave., Detroit 4, Mich.

HOparth 9164-5

What STERLING is to silver GUID is to Reamers

Speed up drilling REAMING AND BORING OPERATIONS .



EXAMPLE OF APPLICATION

Esco Jig adapted to drill various diameters of round stock. Adjustment pin is provided for gauging distance of hole from end of piece.



SAVE THE COST OF SPECIAL JIGS AND FIXTURES!





tion costs.

The exceptional speed with which the Esco Drill lig can be loaded and unloaded marks the big difference between the Esco and ordinary jigs. By reducing loading and unloading time to a few seconds, it makes possible amazing increases in production rates, with corresponding decreases in production

In addition, its low price makes it the ideal solution to the problem of tooling for small and medium size runs which would not justify the expense of special jigs and fixtures— because it can be changed from job to job by simply chang-ing adapter blocks and bushing plates.

Send for literature showing a number of typical applications. You will then see at a glance how well the Esco is adapted to perform the types of drilling, reaming or boring operations that your particular jobs require.

Complete Engineering Service

ESCO ENGINEERING CORP.

5987 Woodward

Detroit 2, Mich. **Branch Offices and Warehouses:**

203 Lafayette **New York City** 13413 Euclid Cleveland

24 W. Wellington Toronto

and return position of cross-slide. Provision is made to set position of lever for convenience of operator.

Attachment has been proven by several years of highly successful operation in production of many exacting aircraft precision parts.

Tool is compact and weighs only 8 pounds, measuring 3% x 3% x 4%". Cutter blades \%" thick are used.

CARDINAL 4-AV VISE



The Cardinal Machine Co., Glendale, Cal., announces release of their new model 4-AV Automatic Air Vise. This new model is said to incorporate an entirely new design of air cylinder which is the result of more than a year of intensive development and testing work.

The new air cylinder is a completely sealed unit requiring no service or attention other than ordinary lubrication. It is a complete power unit including valves and control lever and is simple and ruggedly constructed for long life.

Clamping pressure has been increased nearly 50 percent over that of the previous model by an increase in cylinder bore. Long life is said to be assured by the new design of valve which is unaffected by water, oil, dirt, or other foreign matter carried from the air supply.

Valve control lever is so located, and is adjustable to such a degree, that simple connections can be made to the drill spindle, automatically synchronizing opening and closing of vise with motion of drill. In the case of milling machine applications or other uses in which vise is clamped to a moving table, similar simple connections can be made to some stationary part of machine thereby effecting the same automatic operation. More detailed specifications and information will be furnished on request.

WHY SPRINGS NEED CHECKING!

Two springs that may look exactly alike may function quite differently when installed in your product. One may be perfect, while the other may be out-of-square, have inaccuracies in the coils, have hidden flaws in the wire, or be too weak or too strong for its intended purpose. Only by checking the springs with a Spring Tester can you be sure that the springs you are using are "right" for your product.

LINK Spring Testers

For speedy and accurate testing of springs—compression, tension or torsion—get a LINK Spring Tester. Hand operated instruments for spot-check, laboratory, and inspection. Also motor-driven instruments for production testing, Moderately priced. Send for complete information.



Write for Circular 107 LINK ENGINEERING CO.
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Get the complete story on Macwhyte Slings

The benefit of our experience in supplying wire rope slings for industry everywhere is yours for the asking. Macwhyte Slings are custom-made to fit your particular needs. There are many types and assemblies—let us take care of your sling requirements.

We'll send you the complete story

Reliable safe loads and strengths on literally hundreds of slings are given you in the Macwhyte Sling Catalog S-7. Pictorial literature shows many ways of rigging up to handle loads safely. Just ask for Catalog S-7 and literature—send request on your company letterhead.

Buy an EXTRA War Bond!

Many types and assemblies

Macwhyte ATLAS Round Braided Slings (patented). 13 sizes in 10 different types.

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Macwhyte MONARCH Single Part Slings. 20 sizes in 10 different types.

Other Macwhyte Slings

Macwhyte also makes Grommets, Multiple Part Slings, Y-Guard Slings...and the Level-Lift Sling that keeps unbalanced loads level. Macwhyte Sling engineers will cooperate in designing the proper slings for your plant.

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NO. BISA-6



TRUARC GROOVING TOOL

The precision boring of internal grooves for retaining rings or other purposes frequently poses knotty problems. The Waldes Truarc Grooving Tool is a new patented device which is said to be the answer.

It can be used with any ordinary drill press, turret lathe or boring mill and does not require skilled labor. Scratching or marring of the work is said to be

bor. Scratching or marring of the work is said to be prevented by ball bearing housings which hold the pilot housing. Accurate adjustment is provided for spacing recesses from either top or bottom surface. A vernier thimble controls diameter of the groove. A positive non-slip drive is obtained because cutters have tapered splined holes fitting tapered cutter shafts. The correct size bushings and cutters are self-contained. The Clar-

ite cutters, being circular in shape, allow



many grindings. Cutters are available for cutting of multiple grooves of any desired widths in one operation. The compact design of the tool assures a minimum of overhang between cutter and drill press or lathe bearings.

Grooves can be located either from top or bottom of a hole. A positive stop can be provided for permanent setups.

While in normal position, cutting edge of cutter is below edge of bushing. When pressure is applied to tool the cutting head advances into the work, cutting a groove the thickness of the cutter.

Spacing of groove is easily adjusted by sliding the movable head either forward or backward. Diameter of groove is controlled by turning the upper knurled section.

A chart is furnished with each tool to show the amount of movement necessary and the operating speed. There are four size ranges available from A covering %-1% up to D for 4-1/16-5½". Full details are available from Waldes Koh-I-Noor, Inc., Long Island City 1, N. Y.

HANDY DRILL DATA

A handy table of decimal equivalents of Twist Drills, printed in pocket size card form, is offered by Engineering Dept., Manufacturers Screw Products, 222 W. Hubbard St., Chicago (10) Ill.

LESSON FOR TODAY

PHILLIPS PLASTIC
DIP TANK

"Maintains Critical Melts at Temperature Variation of LESS THAN 5° F."

You can melt ethyl cellulese compounds in the Phillips Plastie Dip Tank and STEADILY MAINTAIN the DESIRED MELTING TEMPERATURE! Phillips engineered Thermostatic controls assure you of a temperature variation of LESS than 5° F.

Ture variation of LESS than 5° F.

The Unit is all steel, are welded, insulated, with controls completely enclosed and protected. Overall discussions are 37° long, 19° wide and 36° high (including legs). Has a 15 gallon capacity of metted though collulose compound. Melt tank is encased in an oil bath by which beat is transmitted through the melt uniformly by convection. No moving parts . . . It's com-

hy which heat is transmitted through the meet unformly by convection. No moving parts . . . It's emplete and compact for highest efficiency.

A Phillips Plastic Dip Tank will serve you as a reliable, trouble-free melting unit to be used in selvening both present and post-war celluloss metting problems. Write TODAY for details and literature covering our complete line of Engineered metal cleaning ma-

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what is DIE-LESS DUPLICATING?

Here is a simple 3-STAGE explanation "DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines — Shears, Brakes, Benders — especially when used as continuous,

integrated production process.



<1st Stage

Cutting flat material to size and shape for part to be duplicated. The DI-ACRO Shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. 3 sizes,—shearing widths 6", 9", 12".



← 2nd Stage

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. 3 sizes—folding widths, 6", 12", 18".



← 3rd Stage

Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing wire (round, square wire (round, square flat), strip stock and other ductile mate-rials in a remarkably wide range of accurate con-





tour forming.

Do You Have Duplicate Parts to Form?

The DI-ACRO System of METAL DUPLICATING WITHOUT DIES has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies

Send for Catalog - "DIE-LESS DUPLICATING" It gives full details on all models of DI-ACRO Shears, Brakes, Benders, and many examples of parts made with "DIE-LESS DUPLICATING".





Pronounced "DIE-ACK-RO"

EIL-IRWIN MFG.CO.

Table shows the diameter for each size of twist drill, whether designated by numeral or letter size. In addition, a handy rule is printed on the card. It will be sent without charge upon receipt of requests from industrial users of fastening devices.

PUSH-PULL LOCK CLAMP



Versatile toggle clamps are winning favor for holding work securely in jigs or fixtures during various assembly and production operations. In step with this trend, a "Push-and-Pull Lock" type was introduced several months ago to serve in

such operations as locating and indexing and is now supplemented by a larger model for the heavier work involving the same production operations.

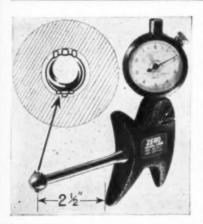
Known as the De-Sta-Co Model 610, this clamp can be quickly converted from "Push" to "Pull" action—or vice versa— in a few seconds, simply by relocating one of the handle bolts, according to Glendon H. Roberts, President of the Detroit Stamping Co., 347 Midland Ave., Detroit 3, Mich. Weighing but 1½ lbs and with an overall length of 6¾" ("Push" position) this heavy duty model has a plunger rod travel of 1½". Rod is tapped to receive a ¾"-16 standard threaded bolt, providing quick adjustment to the work being handled. Its finish is a silvery-toned rust-resistant plating.

Complete details of the new 610 clamp, as well as clamps for various other operations, are given in the new De-Sta-Co

Toggle Clamp catalog.

AUTOMATIC SCREW DRIVER

Reed-Prentice Corp., Worcester 4, Mass., offers the "Screwmatic", an automatic screw driver operated by air or electric power designed to drive screws in wood or metal.



All inquiries answered promptly Write for information to . . .

The Zero Internal Gauge

Model H2 was designed for accurate checking of holes from .500 to 1.000" in diameter. Standard length of this gauge is $2\frac{1}{2}$ " but other lengths are available on order.

Two contact points and two equalizers are provided on the gauging head to assure accurate readings on the .0001" indicator. With each diameter extension the gauge has a 1/16" range and can be set up with measuring blocks or micrometer. Head is not separable from barrel. Construction is sturdy and simple, and the gauge is designed for heavy duty production use. Readings are not affected by temperature.

Our gauges in use at Pontiac, Cadillac, Packard, Westinghouse, Allison and various other companies.

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Your Diamond Wheels

GIVE BEST RESULTS WHEN LUBRICATED WITH STADOIL DIAMOND LAPPING OIL

The only lubricant designed for diamond wheel lubrication, and recommended to you by the carbide tool and diamond wheel manufacturers to give you that tool finish so essential with the carbides.

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The NEW-



AUTOMATIC FEED CONTROLS for engine lathes OPERATE THE HALF-NUTS MECHANICALLY



Attached to apron of the lathe carriage. Changes only handle of original equipment. Can't interfere with conventional use of lathe. May be made inoperative in a minute if desired. No need to ever remove.

FAST ACCURATE SAFE

Models for LOGAN and ATLAS Lathes \$22.50

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INDEPENDENT SPECIALTIES

152 W. 75th St., Chicago 21, III.

The easily detached self-filling magazine (replaced in a matter of seconds) allows almost continuous operation with no hand feeding necessary. Each screw is driven to a pre-determined depth as a gauge on the spindle drive cuts off the torque; rotation of the blade is stopped, protecting screw heads and the work surface against marring. It will drive all standard or special head screws including slotted, Phillips, square and octagonal.



Filling of the magazine is accomplished by a semi-automatic filler. Screws feed automatically into the chutes which lead to the nine fill channels. When the lever is pressed, the magazine indexes and only four stops are necessary. One refill machine adequately services five Screwmatics.

Light and portable, well balanced, easy to handle, the tool weighs six pounds when filled with 1/4" No. 6 screws.

STRAND CATALOG NO. 29

N. A. Strand & Co., 5001 N. Wolcott Ave., Chicago 40, Ill. has issued a new catalog No. 29, called their Fortieth Anniversary Issue.

It contains 112 pages of flexible shafts and machines—125 types from $\frac{1}{6}$ to 3 hpvertical types, single direct drive, three-speed countershaft drives and horizontal types. There are over 350 attachments interchangeable with these machines covering a multitude of labor and saving operations.

There are a great many illustrations of the various kinds of machines, and specifications are given for each. It is an attractive catalog with a plastic binding which permits the book to be opened flat.



ably ready for delivery-or can be quickly made to your specifications. Complete manufacturing

facilities are available to solve your marking problem.

WRITE DEPT. B FOR FULL DETAILS-TODAY!



TOOL SPECIALISTS FOR 25 YEARS

METAL DIE AND TOTH STREET, LOS ANGELES 15. CALIFORNIA



To meet situations where extraordinary pressure is required for clamping at an

angle to the base mounting, a new wggleaction clamp has been designed by Knu-Vise, Inc., 1334 Plum St., Detroit (16). It is known as Model KV-221 and is slightly larger and sturdier than the company's model KV-220.

This clamp can be used to advantage inside of jigs where operating space may be limited. It can also be used as a locating device in progressive drilling fixtures.

The clamp weighs 23 ounces, measures 71%" in height and 61%" in length. Its recommended load at end of the standard toggle bar is 240 lbs. The company will supply full sized templates upon request.

CERIUM ALLOYS

Two lists of references to the uses of Cerium as an alloying agent in conjunction with aluminum and magnesium are available. These annotated bibliographies have been selected from English, French and German material of the past 20 years. Important articles are briefly summarized. Sources are indicated. Patents are listed. Copies of both bibliographies are available, without charge, from the Cerium Metals Corp., 522 Fifth Ave., New York 18, N. Y.

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MEASURING A PLUG GAGE with LIGHT WAVES using an optical flat, a toolmakers flat and a gage block

The formula is:

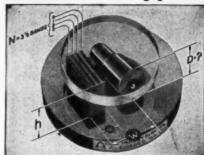
 $D = h + (.000012 \times N \times ...$

Substitute the actual values

D=.750 + (.000012 x 3 1/2 x and get the answer

D = .750168 inch.

It's just that simple!

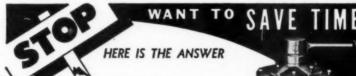


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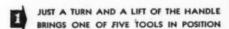


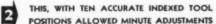
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Makers of Standardized Jig and Fixture Bushings 210 N. Laflin St. MONroe 4122 Chicago 7, III.



Our NEW IMPROVED **5 STATION LATHE TURRETS**





MADE UP IN FOUR FOR LATHES FROM 9" to 30" SWING



Complete Details

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"UNIVERSAL" 3-WAY

Reduce by 1/3 to 1/2 the time now spent setting up jobs. No hunting for clamps, bars, parallels. Clamp the work in the "UNIVERSAL"—swivel to angle wanted and you're ready to go. The "UNIVERSAL" can be moved from machine to machine without disturbing the set-up. It is a rugged, carefully engineered, heavy duty vise, weighing 50 pounds. It gives you great work capacity in a compact size.

Only 7% inches high (closed), the "UNIVERSAL" has a full 5 inch jaw opening, 5" wide and 1%" deep.



Contains complete "UNIVERSAL" story. Specifications. 12 Job Application Sketches. Information on Tool Bit Grinding. Suggested Cost Analysis Form. Write today, for your FREE copy.

UNIVERSAL VISE & TOOL CO. (33 Main Street, Parma, Mich.

Makers of Machinists' Vises, Universal Angle and Surface Plates, "Gravity Feed" Metal Cutting Bandsaw.

ROSAN INSERTS



The metal of the reduction-gear housing of a Curtiss propeller motor, was too soft to assure permanent fastening with cap screws inserted directly into the metal. Rosan Locked-in Inserts were therefore used as shown, to furnish fastening points which would give the soft metal the fastening strength of steel.

These inserts consist of two pieces:—An insert with a serrated collar, and a steel locking ring which is serrated inside and out. Insert is screwed into a counterbored tap hole, flush with the surface of the parent material, and the ring is then pressed or driven into counterbore. Inner teeth of the ring engage the teeth on collar of the insert, while outer teeth broach the wall of the counterbore and lock insert in place. The unit then becomes an integral part of the parent material. It cannot turn or loosen under vibration or torque, but it can be easily removed for replacement by a simple shallow drilling operation, which does not disturb the parent material.

The manufacturers, Bardwell & Mc-Alister, Inc., of Hollywood, California, have also developed other applications of The Rosan Locking System, such as the Rosan Lock-in Stud, and the Hydrau-



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A recent addition to the COLBORNE line of Speed Lathes is the Series 30 machine. This speed lathe is indispensable for economical polishing, grinding, burring and lapping.

Very compactly constructed to do highest quality very compactly constructed to do highest quality work with the COLBORNE features of spindle bear-ings running in oil, instant stopping brake, easy opening collet and standard speeds of 600-920-1720-3280-4800 RPM using 3/4 H.P. motor and cone pulleys. Collets and chuck may be used.

For more production per day choose COLBORNE.

COLBORNE MFG. COMPANY

BUILDERS SINCE 1879

157 Division St.

Chicago 10, III.

lic Seal insert, and the Thermometer Bulb Insert, in answer to the demands of industry for permanent fastening in soft materials. These units all operate on the same locking principle.

TAPPING SMOKE SHELLS

Greatly increased production rates when tapping an 300" 16 NS thread for a class 3 fit to a critical depth of exactly \(\frac{8}{2} \) from the nose of an 81 mm smoke shell and concentric with the bourrelet of the shell is reported in the use of a standard lead screw type tapping machine with simple hand operated fixture at a large Southern ordnance plant. In addition to upping production to 300 tapped pieces per hour—an average floor-to-floor time of 12 seconds—this equipment designed and built complete by Detroit Tap & Tool Co., 8432 Butler Ave., Detroit, Mich., has also practically eliminated rejects while permitting machine operation by less skilled workers than previously needed on the job.

The operator sets an 81 mm smoke shell—which is light enough to be held in one hand—into the fixture over a plunger and against a 'V' block in back of the shell (see photo). With his other



hand, the operator swings the lever about 60°. This lever is connected by a rack



TO AVOID MAKING SPECIAL FIXTURES

This Vise Will Do the Work . . . Lots Cheaper!

When you have a milling or drilling job that you thought would require a special fixture, here's a simple way out! Let us design and build you a special vise, using 'he Presto-Vise Holding Unit. (See illustration above).

The cost of such a vise is surprisingly low—a fraction of what a special fixture costs—and it can be made in a fraction

of the time, enabling you to get into production much more quickly.

If you will send us a part print, we will gladly submit a cost

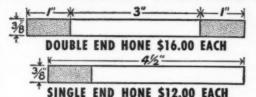
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THE 100% TUNGSTEN CARBIDE DIAMOND HONES Made in . . .



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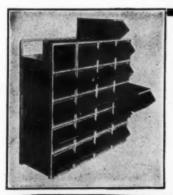
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REDUCE HANDLING of Tools, Parts and Materials

Because Stackbins are portable containers — not fixtures — tools, parts and materials can be earried to departments, from machine to machine, or held in stockrooms without being transferred from one container to another. Stored in Stackracks, any Stackbin is instantly accessible when its contents are needed — without disturbing any other bin.



STACKBINS are individual hopperfrented stacking bins, designed for storage, transportation and assembly.



STACKRACKS are individual units which lock together to form storago racks of any size, shape or capacity, into which Stackbins slide like drawers.

Manufactured and sold in Canada exclusively by Walter H. Wickware, Ottawa. Write Stackbin Corp., 55 Troy St., Providence 1, R. I.

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STACKBIN

"Stacked and



SYSTEM

Still Accessible"

and pinion not only to the plunger support but also to the transverse clamping bar. Thus, swinging the lever forward causes plunger to elevate shell until nose contacts the lower surface of locating platen, while at the same time, it moves the simple transverse clamping bar to the left, locating shell horizontally against 'V' block and clamping it into place. In this way, the smoke shell is both located and clamped concentrically with the tap spindle and to exact height of the nose in relation to the tap spindle with but a single, short movement of the lever.

Positioning of the smoke shell in this manner assures uniform concentricity and depth of thread on each shell. Returning lever thru the 60° arc frees tapped shell for unloading, cutting total time required for loading and unloading to the minimum possible. Inasmuch as drive to the tap in the Detroit light duty tapping machines is at base of the lead screw, wind-up is eliminated making possible a fast return without injuring the cut thread. With this arrangement, metal does not pile up on back of tap teeth, thus insuring "clean", accurate threads.

POPE LIVE CENTER



Heat expansion of work on the lathe often puts destructive loads on live center bearings unless provision is made to take care of this extra load. Without such provision the workman must loosen the center by hand in an attempt to release the excess end pressure. If he loosens it too much the work piece may be spoiled. If he loosens it too little the bearings may be damaged. With dead centers, smoking oil warns of excessive pressure,



Repays itself quickly in savings on metal cutting saws

Savings in cutting hours and greatly reduced blade replacements will enable this machine to return its investment in a short time.

It's fully automatic, grinding from 30 to 75 teeth per minute. This is the only combination circular band and hack saw grinder made that does not depend on the shape of the grinding wheel edge to shape the cutting edge of the tooth. Available in bench and floor models. Bulletin on request.

ALL PURPOSE: Sharpens a wide range of sizes in circular, hack and bond saws as small as 32 teeth to the inch, for metal and woodworking purposes.

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Bench or Pedestal Type
MODERATELY PRICED

CATSKILL, NEW YORK

TOOL CRIBS



WINDOW GUARDS WIRE MESH

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SEND FOR CATALOG
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THIS IS OUR FORTY-SIXTH YEAR

WHITNEY- JENSEN PRODUCTS



ROLLER BRAKES

Roller bearings at important points make them faster, easier working. Combination type for box and pan as well as all kinds of straight bending. Made in 4-5-6-8-10 ft. sizes and 12, 14, or 16 ga. capacity.

Write for New Catalog No. 16-45.

WHITNEY METAL TOOL COMPANY

but no such warning occurs with live centers.

It is claimed that the Pope precision compensating live center tailstock spindle successfully provides for axial movement to take care of work expansion without losing any of the accurate centering support furnished by the preloaded radial bearings. Spindle is mounted on oversize precision bearings, properly preloaded and having abundant capacity to carry radial loads. End thrust is taken on a separate set of preloaded thrust bearings yieldingly mounted in a manner that allows for work expansion without building up excessive pressure on the bearings.

With the new Pope Tailstock the operator has only to set up work and adjust center. No further adjustment is required. Sealed lubrication is a feature of this tailstock spindle as of other Pope spindles. Spindle is not dependent on the operator for lubrication or adjustment.

The Tailstock pictured is for a production engine lathe. It is 53" long, 6\%" in diameter. Its center is readily removable without disturbing bearings. This spindle is capable of supporting work pieces weighing 10 tons or more. Centers for lathes of other sizes are available with this automatic compensation feature. Complete information as to specific application may be obtained from Pope Machinery Corp., Haverhill, Mass.

MILWAUKEE DIE FILER



The versatile, bench-type, reciprocating filing machine, formerly known as the Atlas Die Filing Machine, has been renamed the Milwaukee Die Filer by its manufacturers Milwaukee Chaplet & Mfg. Co., 1027 So. 40th St., Milwaukee, Wissent changes in the design and construction of this popular "toolmakers

All are C-F POSITIONERS



Modern welding specifications call for "positioned welding through-out," and today in all parts of the country, we find endless streams of war materials coming off production lines of C.F Welding Positioners. Some of these lines are blocks long and made up of identical positioners on each of which is built a complete unit. In others like the 3 positioner sub-assembly line above, the C-F Positioners are progressively larger as the weldment increases in size and weight.

capacities: 30,000 lb Write fer Bulletin WP-22

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1321 South Kilbourn Avenue Chicago 23, III.

WHY FOUL COOLANT



When spoilage occurs, machines must often be cleaned out and new coolant prepared. This means needless

waste of precious materials, loss of vital man-hours. Dolge Steridol service can reduce your operating costs and give your operators clean, decent material to work with.

Let a Dolge service man make a competent examination of your coolant to determine whether sanitation is indicated. A sample is all he requires for laboratory analyses. Then a complete, confidential report will be submitted promptly without charge. Write for booklet J-2 on "Cutting Oil Sanitation".

THE C. B. DOLGE CO., WESTPORT, CONNECTICUT

STERIDOL Cutting oil germicides

CUTTERS



Hand Power Lever Action

RODS • FLAT BARS • ANGLES

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Catalog No. 8 on request

T. H. LEWTHWAITE MACHINE CO.
311 East 47th St., New York 17, N. Y.

HELP
CONSERVE
PAPER!!
Pass this
book on.

tool", have resulted in further simplification of its operation and adjustment.

The Milwaukee Die Filer is used extensively in tool, die and machine shops in a variety of filing, sawing and lapping operations. It is also used in foundries and metal working plants for fast precision trimming of small castings, stampings, forgings and other metal parts.

In tool and die making, one of its principal advantages is the ease and speed of inspection it permits when used for internal filing or sawing. The file support unit or saw overarm may be swung out of the way instantly enabling operator to remove die block quickly for frequent checking, and return it immediately to the exact original setting.

ting.

The saw overarm may be substituted for the roller file-support arm in a few minutes. Hold-down fingers are attached directly to saw overarm. Accuracy of the saw attachment permits extremely accurate work, leaving very little metal for subsequent filing. The Milwaukee is used extensively for lapping operations as lapping-sticks may be substituted for files or saws by means of a simply constructed lapping-stick holder which is readily inserted into chuck jaw.

Working surface is entirely clear at all times and may be tilted 12° in two directions to suit operator's convenience. An improvised type of chuck has movable, hardened jaws which hold files, saws or lapping-sticks mounted in a metal holder.

Cutting efficiency of the unit is based on the length of travel per minute. At its rated speed of 325 to 450 strokes per minute, considered correct for machine filing, its 1½" stroke covers from 487 to 675 cutting inches per minute, a highly satisfactory rate for filing machines of this type. The machines are regularly equipped with standard 110 Volt, 60 Cycle a-c electric motors, file roller supports and saw overarms, but are available without the saw overarm or without motor if desired.

NATIONAL HELEX END MILLS

A 16-page booklet describes "Helex" End Mills, a newly-developed product of the National Twist Drill & Tool Co., Rochester, Mich.

These tools are designed for milling slots, keyways and pockets where ordinary arbor type milling cutters cannobe used. Because of the high helix angle of their cutting edges, and the general free cutting construction, they operate smoothly and efficiently even at high speeds.

STATIC BALANCER



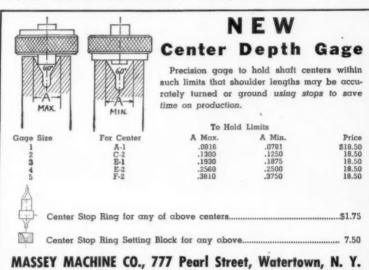
A new precision-built "static balancer" has been developed by Samuel S. Gelber, 32 S. Jefferson St., Chicago 6, Ill. Reasonable in price, compact and readily portable, the new balancer has several dis-

tinctive features that should make it especially useful in shops where rotating parts have to be balanced. The 8" model illustrated has a fingertip span adjustment up to 9½".

Easily set up on any reasonably level surface, the balancing surfaces have builtin level adjustment screws to compensate for high or low spots in supporting surface and the built-in spirit levels make it easy to get accurate settings. The balancing surfaces are deep-hardened with ground and honed razor straight edges for extreme sensitivity. The supporting standards are lightweight and durable. Swing capacity is 9", supporting capacity is 50 lbs., and shipping weight is 2 lbs. A piece of plate glass supported on the balancing ways and levelled by means of the fingertip levelling adjustments provides a convenient and accurate surface plate.

Two larger models are available in the $20^{\prime\prime}$ and $30^{\prime\prime}$ size.

Inquiries are solicited from responsible sales representatives.



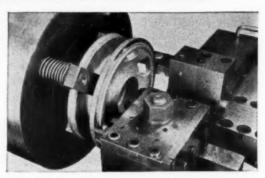
ENGINE LATHES RECRUITED FOR FINISHING OPERATION

TANDARD engine lathes were recently adapted by the Apprentice Division for a finishing operation on small generator mounting flanges at General Electric's Lynn River Works when precision boring and turning machines, or automatic lathes normally employed, were un-available. The operations involved facing the bolt flange and hub, and finish-turning the rabbet, with a tolerance of +.000 and -.002

The rabbet diameter sizing cut was considerably simplified by this new method, by mounting the tool in an inverted position



MORE THAN 150 DIFFERENT COM-BINATIONS of Westinghouse Industrial resistance welding control will soon be possible from only 11 standard basic units. From these units it will be pos-sible to factory-assemble welding controls that will meet the diversified needs of industry which at present are only available thru individually designed and custom-built controls. Here T. R. Law-son, Resistance Welding Application Manager, uses planning models to demonstrate the ease and simplicity of building up any wanted type of control.



in a bridge-type tool holder with a pivoting arrangement for tool adjustment. The holder was attached directly to the carriage of the machine, and thus was not affected by movement of the cross slide.

For facing cuts, gang tools, in the proper relationship to each other, are set in a tool block on the compound. They are controlled in one direction by adjustable stops clamped to the cross ways of the carriage, and in the other direction by a gage block and a standard micrometer stop on the main ways.

The carriage should be located axially against the gage block, between the micro-stop and carriage, when facing the flange and roughing the rabbet. The last few thousandths of movement, which rough the diameter of the rabbet, are taken by hand.

When facing the hub and sizing the rabbet, the cross slide is located against the outer stop on the cross ways. The carriage is fed axially until it contacts the micro-stop, without the gage block in between. This obtains a finished diameter on rabbet from the fixed tool at-tached to the bridge holder. It also sizes the end of the rim adjacent to the rabbet, and the end of the hub, by plunge cutting two tools held in the tool block on the compound.

BACKSTAND BULLETIN

The new DBY Backstand and its applications are briefly described in an interesting 4-page bulletin issued by the Divine Brothers Co. of Utica, N. Y. Also included are illustrations and complete specifications of the Backstand and the VM-DBX Lathes. A copy of this booklet is available upon request.

THE ONLY HEAD



The Universal Precision Indexing Head can be used on any tool or surface grinder. Holds straight shank tools up to 1" diameter in standard Hardinge pull-in collets (Type 1-AM). Quill is ground to hold No. 4 Morse Taper tools. With conversion sleeve (furnished) holds tools up to No. 9 B & S Taper. Graduated 360° in 3 planes. Prompt delivery.

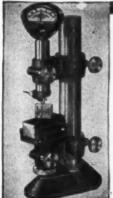
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SENSITIVE
LIGHT
COMPACT
STURDY

SWEDISH GAGE CO., OF AMERICA

GRINDING HOOK SHANK TAPS

A new grinding attachment for sharpening bent and hook shank taps is announced by Edward Blake Co., 634 Commonwealth Ave., Newton Center 59, Mass. This attachment can be mounted on, and remove d quickly from, any Model No. 2 Blake Tap Grinder now in use.

The Blake uses a center to support the front of the tap, and a short grip collet on shank immediately back of threads. It is said tests have proven that this is the most accurate method of holding bent or hook shank taps during the sharpening operation, as

on many taps of this type, the shank may not be true with the threads.

The attachment will permit grinding the chamfer on any bent shank tapper tap up to ½"—13 used on the ½, 3/16, ¼.

% or 1/2" automatic tappers, and any hook

shank tap up to 9/16"-18 used on ¼, ¾s or ½" Precision Tappers, as made by the National Machinery Co., Tiffin, Ohio.

Either right- or left-hand taps with 2, 3, 4, 5, 6, 8, or 10 flutes may be sharpened on the chamfer, with any amount of relief desired. Both precision and speed are attained, as the Blake Tap Grinder is operated in the usual manner when the attachment is used.



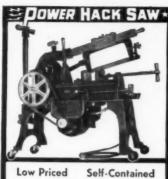
INDUSTRIAL "ACK-ACK" GUN—This could be a six-barrelled anti-aircraft gun ready to point skyward at enemy planes, but it's really an automatic machine for speedy production of flywheels for war-needed motors. With all "barrels" operating at once, six 12-foot-long bars are fed into the openings to be machined. This is about 14 times faster than the older method of machining them singly. The machine, recently installed at the Westinghouse East Springfield Works, weighs 25.000 pounds and measures 22 feet in length.

BROACHING BULLETIN

A four-page, two-color folder (Bulletin VAD-44) describing its standard line of improved Dual Ram broaching machines specifically designed for surface broaching has been issued by Colonial Broach Co., P. O. Box 37, Harper Station, Detroit 13, Mich. The machines are especially designed to provide maximum output combined with continuous high precision.

A feature of the bulletin is a case history illustrating the flexibility in use of the new Dual Ram machines. On only one odd-shaped part—a valve rocker arm held to close tolerances—five Colonial dual ram machines are performing most machining operations including the simultaneous broaching of flat and radius on top of rocker on one machine; the simultaneous straddle broaching of one end and the facing of the other end at different angles on another machine; broaching contours on both ends of rocker on a third machine; etc.

Tables of specifications and dimensions and a complete description of the standard line of dual ram machines—which range from 5 tons capacity with a 42" stroke to 25 tons capacity with a 66" stroke are included in the bulletin.



Portable
Ready to Work—Economical

Sturdy

Write for Bulletin No. 100



Pictured: a 38-Spindle Heavy-Duty
Drill Head.

DESIGNERS AND
MANUFACTURERS OF
MULTIPLE DRILLING EQUIPMENT

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- Babbitrite eliminates the danger of blowouts . . . serious injury to workmen.
- It contains no moisture to generate steam when in contact with hot, molten metal always "sticks to the mold".
- It prevents loss of time, waste of metal; speeds up babbitting operations.



 Babbitrite is always ready-foruse, requires no mixing, may be re-used 100 times, Try it!

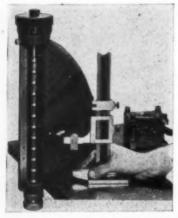
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THE PLA-CHEK GAGE

Pla-Chek, an interesting new gage for surface plate work, has been developed by Cadillac. According to R. E. Bauer the general manager, this gauge, guaranteed accurate from .0005" for any size from .001" to 12" from the surface of the plate, is many times faster than ordinary gage blocks.



Pla-Chek is made from a hardened steel bar with 12 steps spaced exactly 1" apart with a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in .0001" on the upper end of the bar and a simple triangular-shaped support bracket.

When checking work on the surface plate, the micrometer thimble of the PlatChek Gage is set at zero. The lower end of the bar and the surface plate are then exactly level. The micrometer is set for the desired dimension in thousandths and tenths of thousandths. The measurement is taken from the desired inch step. Measurements are guaranteed accurate to .0005" for any size from .001" to 12" from the surface plate.

"Pla-Chek will speed surface plate work and increase the accuracy of this type of inspection to a degree unknown up-to-now," according to Bauer. For further information address Cadillac Gage Co., 20316 Hoover Road, Detroit 5. Mich.

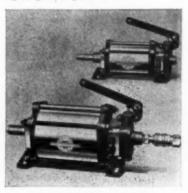
A LARGER BELLOWS AIR VALVE

A new, more powerful "big brother" to the Bellows BM5 Air Motor is being introduced by The Bellows Co., 861 E. Talmadge Ave., Akron, 10, Ohio. The new motor, the BM10 develops more than twice the piston thrust force of the standard BM5 motor on a given air line pressure. (10.32 against 4.9 times the operating air line pressure).

The BM10 retains the same basic principle of integral valve, operating and speed controls which adapted the BM5 to a wide range of machine production processes.

Bellows Air Motors are small, compact, powerful air-driven reciprocating power units. They operate on any air line pressure up to 175 lbs. They differ from conventional air cylinder design in that the valve and all operating controls are integral with the cylinder, permitting full and positive control over all operating phases at all times. Installation is simple and easy. Only one air connection is required which may be either with flexible air hose or rigid piping.

Independent speed control valves provide precise and unlimited speed control of piston rod advance and retraction. The valve operating lever is adjustable to "any angle in any plane" permitting easy connection and ready synchronization to any reciprocating movement.



DURO MACHINE TOOLS

An attractive 24-page catalog (E-43-D) has been prepared by Duro Metal Products Co., 2851 N. Kildare Ave., Chicago, Ill. Many different types of Duro drill presses are illustrated along with band saws, table saws, jointers, grinders, lathes and other equipment. Specifications and prices are given for each.



4 CALIBRATION RANGES . . . wider dial graduations for easier, faster reading, more accurate tension tightening.

98% ACCURATE under most severe conditions . . . constructed so that shocks and jars will not interfere with mounting of dial.

MOSSBERG TORQUE TOOLS are widely used by the Navy, leading aircraft makers, automotive and machine assembly and maintenance shops, on railroads, Diesels and other marine power plants.

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MORE POWER LESS WEIGHT

1/6 H. P. AND 35,000 R. P. M. UNDER LOAD-WEIGHS 35 OZ.





Use alone or mount in stand, vise, or lathe,

Twice the power and twice the speed of any other elec-tric handtool! Use for faster, smoother work on steel, nonferrous metals, plastics, and most other materials. Speeds up to 35,000 r.p.m.

FINISHES under load reduce frictional wear on mounted wheels by as much as 200%.

GRINDS

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Fully cased in durable, light-weight plastic and fully guaran-teed shockproof without ground wire on AC or DC. For close jobs attach COOLFLEX Flexible Shaft to extend full power and speed to 9 os, cool-running hand piece,



Send for 20 page "Facts and Fig-ures" Booklet.

Precise Products Co. 1331 Clark Street Racine, Wis.

HE PRECISE 35

REPAIRING WARSHIPS

Enough electric equipment to furnish a good-sized factory plus a small hotel is installed on each floating drydock the Navy is using to make emergency re-pairs of warships far from their most ad-vanced permanent bases, engineers of General Electric disclosed recently. These floating factories, recently re-

vealed to be in action, are changing the concept of naval warfare by enabling strategists to plan ocean-going opera-tions without dependence on the availability of fixed bases.

In operation, these mobile drydocks prepare a warship for repair by literally

lifting the damaged vessel out of the water, thus giving workmen access to any part of the hull or deck, the same as if the ship were being overhauled on land.

This is achieved by admitting water to sealed compartments so that the drydock submerges. When accom-plished, the damaged vessel is floated over the dock or the dock is submerged under the vessel. Then water is pumped out of the compartments.

Tho several different models of floating drydocks are presently in operation, the newest and most radical of these is the advanced base sectional type, in which 10 separate units, or barges, are joined together to form a repair dock that can accommodate a battleship.

Because each barge is a complete unit in itself, as well as a "hotel" for the men who comprise the service crew, great

amounts of electricity are consumed. This is generated by diesel-driven generators on each section. Current is used to operate machine tools, cranes, welders, anchor windlasses, hoists, blowers, compressors, ventilating and refrigerating units and pumps for emptying and filling buoyancy compartments.

Unable to navigate under their own power, sectional drydocks are towed by other vessels to protected locations and there assembled and put into operation. Their latest repair equipment enables them to overhaul huge warships in short order and send them back to bases under their own power or back into battle.

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We also manufacture angles and parallels as shown underneath surface plate.



We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. Write today for full information.

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30-45-60° Angle, with Brass Separators, Brazed in place. Size $2\frac{1}{2}$ "x $2\frac{1}{2}$ "x $3\frac{1}{2}$ " long. Priced \$35.00 each.

K-125 Magnetic Parallels

Sold in Sets of Two Blocks, with Bakelite Separators. Size, 1-3/32" x 21/4" x 4" long. Price, \$12.00 per Set.

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SUPREME Brand Hard Edge Flexible Back Metal Cutting BAND SAWS



Have you been bothered with frequent band saw blade breakage, soft cutting edges, uneven set, or lack of proper temper?

If so, put on end to such trouble by using SUPREME METAL CUT-TING BAND SAW BLADES.

Available in continuous bands for any machine or in coil form for radius or pattern cutting machines. All sizes permitted by WPB. When ordered in 100' lengths, coils are packed in handy containers.

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The BUFFER-SLOT COUPLING lengthens the life of your Motor-Driven Machines by reducing wear and absorbing the load-shock and vibration that are the sources of most machine failures. It gives you all the advantages of the ordinary coupling and in addition restores to your Direct Drives, that protective resiliency you lost when you discarded the Belt Drive. It is a long-lived dependable device especially valuable for use with Ball ar Babbitt Bearings, SEND FOR BULLIETIN No. 24-B.



BROWN ENGINEERING CO.



BENCH CENTERS

Removable Centers are tool steel, hardened and ground. Equipped with spring-type tail stock. Made in 6 inches diameter, 18 inches between centers.

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LEACH External Grinder

\$875.00

Fully Equipped

Grinds work from 3/4" to 11" in length and from 1/8" to 7" in diameter.

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*Uniform Temperature Fast Heating

Portable Handy The heating element in the Temco furnace operates with unusual speed. A working temperature of 1500° F, is attained in only 30 minutes and intermittent peak loads of 1850° F, are within the practical range of this rugged, long life furnace. A four point switch provides temperature control in four ranges and adjustable rheostat bands allow close heat selection within any range. The accurate, dependable pyrometer is calibrated to 2000° F, and 1100° C, in 50° increments.

*MUFFLE CHAMBER has the exclusive feature of an embedded heating element which covers all four sides of the heating chamber. This eliminates "cold spots", assures a uniform temperature in every part of the chamber, and protects the elements against damage and oxidation.

Temco furnaces are built for either 115 V. or 230 V. Current consumption 1200 watt maximum. Heating chamber 4" wide, 3\%" high and deep. Outside dimensions 8\%"x13\%"x13\%"x10". Shipping weight 30 lbs.

COMPLETE WITH PYROMETER (115 V.)

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For 230 V.—\$5.00 additional

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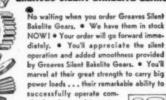
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ARTUS ARBOR SPACERS The COLOR tells the THICKNESS

ARTUS Arbor Spacers made of plastic in various colors identify thickness at a glance! 001, 0015, 002, 003, 005, 0075, 010-030. Speed up accurate fitting at low cost. Write for folder.

CONVENIENT TRIAL OFFER **Handy Spacer Assortment**

.001 - .0125 thick 10 eg. .015 - .030 thick 5 eq.

100 SPACERS IN ALL

7/8" -- \$2.80 $1\frac{1}{4}$ " — \$3.40 $1\frac{1}{2}$ " — 4.20 - 3.00

Other standard sizes also available.

Illustrated Folder Free. Immediate Delivery on Spacers, Gaskets, Shims

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ANGLE & RADIUS DRESSER

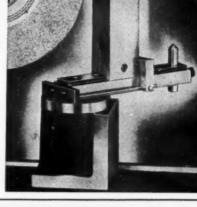
A sturdy, quality instrument designed by form-grinding specialists to dress both angles and radius at low cost. Two 1/3 ct. diamonds and instrument case included — \$150.00 complete.

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Large range. Chatterless and dustproof. .0001" accuracy obtainable. Simple to operate. Reasonably priced.

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JOHNSON MACHINE AND PRESS CORP., ELKHART.

Tripping



Today's "green" women operators make production safety even more difficult to control. Another reason why Federal Dial Feed Presses are so widely used. Illustration shows one in operation at American Cabinet Hardware Corp. plant. Note operator's position—convenient for rapid feeding, yet far from danger zone. Yes, Federals are safe—fast, smooth and precise, too. Get all the facts. Write for catalog.

Order now—with priority, for war requirements—without priority, for early post-war delivery.

THE FEDERAL PRESS CO.

1606 Division Street, Elkhart, Indiana Telephone 2831 PRESSES

CUTTER SHARPENING

The cutter sharpening subject is a large one indeed. The methods used for sharpening a given type of cutter in one shop may be entirely different from those practiced in another. It is perhaps pertinent to observe that manufacturers of given types of machines and cutters, not infrequently furnish cutter sharpening equipment for the machines of their own manufacture. Whether they do or not, they are usually in a position to give the best advice with regard to sharpening cutters.

An outstanding case in point is that of

hobs. A prominent maker of hobbing machines and hobs provides automatic hob sharpening machines also, which make correct sharpening an easy matter, reproducing original accuracy and efficiency on either straight or spiral teeth. This company also provides combination sharpening machine, incidentally, which is ideal for shops having a limited number of hobs to sharpen. It will also handle the sharpening of reamers and other cutters. It is very precise, and comparatively simple to use.

Oilstone files should not be overlooked with reference to sharpening various kinds of dies and tools. As provided by some, they are impregnated with oil at the factory, and cut smoothly, fast and cool, when purchased in the proper grade for the purpose.

Hard Arkansas oilstone files may also be obtained,

which are very fine, and slow-cutting. These are meant only for the highest finish on tool edges, and are prized by many for use in tool and die making. Care in the final finish of cutting edges pays big dividends in cutter performance and cutter life.

In a cutter grinder, easy handling is a matter of great importance. One machine in particular has the table slide arranged to roll on balls of hardened, heat-treated steel. The headstock and tailstock are both provided with clearance setting dials, which provide for correct angular settings.

EXPANDING MANDRELS Twelve Champion Expanding Mandrels will do the



The Only Mandrel That Completely and Accurately Fills the Hole.





Use TORNADO

for Quicker Cleanups

POWERFUL suction from 1 h.p. G.E. motor makes quick work of cleanups of plant—floors, walls, overhead pipes, etc.

12-gal. tank. Portable anywhere. Plugs in at any electric outlet. Weighs only 40 lbs. Keeps plant clean for faster production.

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DIE HEADS

Automatically opens at a predetermined length of thread.

Instantly withdrawn from stock without reversing machine.

Instantly set from a rough cut to a finish cut of thread.

Button dies quickly changed.

Less set-up time. Low cost.

Accurate speedy thread cutting Is assured with these DIE HEADS. A wide range of capacity of each size die head means a small investment, and makes this modern DIE HEAD the ideal general purpose thread cutting tool. For tough threading jobs where constant uninterrupted operations are essential, the BHICO DIE HEAD will do them.

No fussy adjustments to be made; Dies removed by loosening of two screws.

In ordering BHICO DIE HEADS, specify DIE HEAD size and diameter of shank.

Ask your Dealer or order direct.

Write For Details, Circular C-1

B-H INSTRUMENT CO.

3321-23 AVENUE S BROOKLYN 10, N.Y.



STANDARD BITS MAKE 4 TO 6 DIFFERENT CUTS IN 1 OPERATIONS

For many types of milling, light metals and plastics as well as steel, there is no longer need for special cutters. A single Newheld Universal Fly Cutter, utilizing any type of standard high speed steel or carbide bits, makes multiple cuts in one operation. In contrast with expensive specially ground cutters, the standard bits used in the Newheld are easily and quickly ground in your own shop, readily replaced or reground for other work, at small cost. There is practically no down-time if a bit is broken.

The Newheld fits all standard arbors, turns

to any required speed for fly cutting, slotting, surface and straddle milling gear cutting, disc and gasket cutting. Standard sizes are 4", 6", 8", 10". Write for details of this versatile, production-upping, money-saving fool.

cuts that can be made with the Newfield Universal Fly Cutter in ONE operation on a horizontal or vertical mill or drill press. Individually adjustable his holders permis slots of any thape to be cut 3/16" to 1-1/2" wide.

Above-a few of the many

NEW-FIELD MACHINED PARTS COMPANY

7160 Melrose Avenue, Los Angeles 46, California

GEAR CUTTING

Before one hundred members and guests of the Windsor Chapter, American Society of Tool Engineers, Charles R. Staub, Chief Engineer, Michigan Tool Co., Detroit, recently revealed operating machine design, and other details in connection with a new process which promises to revolutionize the speed with which gears can be produced.

The new "Shear Speed" process is distinguished from other methods of gear cutting in that all teeth of the gear are cut simultaneously instead of one or two at a time.

It is reported that the process, which

is already used in experimental production in some plants working on war materiel, reduces the time required to cut a given gear from many minutes to a minute or even less.

Despite the high production speed, the new "Shear Speed" machine, accord-ing to Mr. Staub is highly flexible in that the same machine may be used interchangeably to cut spur or helical gears, splines on shafts, etc. In changing from one gear size to another it is necessary only to remove the cutter assembly, re-place it with the correct cutter assembly, and ad-just feeds and speeds of the machine as desired.

Thus, while the machine is primarily designed for mass production of gears, it lends itself equally well to job shop work

providing the range of gears is within the capacity of the specific machine employed.

In mass production of gears, the machine has the advantage of enabling exact determination of the number of machines required for a given output, a difficult factor to determine, except thru trial, with other types of gear production processes, Mr. Staub explained.

In general, the machine "semi-finishes" the gears, leaving only a slight amount of metal to be removed on "shaving" machines to obtain the highest precision gears produceable.

New Britain UNIVERSAL VISE

THE ORIGINAL

Swivels 360 degrees horizontally, 100 degrees vertically, to give any angle or compound of angles.

Write for Farther Information.

NEW BRITAIN TOOL & MFG. CO.



of Inspectors or Operators.

Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.

DON'T GAMBLE



PRODUCTION DELAY COSTS REAL MONEY!

When any machine goes "Down for Repairs" your production "Jams Up." To get that machine running again may cost only a few hours delay, but—the production lost can mean thousands of dollars.

Loss of Profits and Loss of Production Can Never Be Made Up!

Invincible angle tool attachments greatly reduce loss by reaching broken parts without dismantling the machine.

Invincible angle tool attachments make your portable drills universal for any operation by converting them into angle tools in a few minutes.



INVINCIBLE TOOL CO.

611-620 Empire Bldg., Pittsburgh 22, Pa.

Makers of Job Tested and Job Proven Tools

SUPERIOR QUALITY AND WORKMANSHIP IN PLUNKET VISES



SQUARE BASE SHAPER VISE

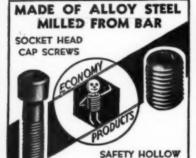
The Shaper Vise has graduated swivel base and tongue in center to fit slot in table, and has holes for bolting down. In ordering this vise give size of slots in Shaper Table, also distance from center to center of slots.

No. 49, 10° jaws, 2½° 4° 600, opens 8½°. Weight 125 lbs.....\$52.00
No. 4, 8° jaws, 1½° 400, opens 5°. Weight 45 lbs.....\$38.00
Our complete line includes Vises for Drill Presses,

Milling Machines, Shapers and Grinders.

Prices are net, f. o. b. Chicago. Write for illustrated folder today. Dealers inquiries solicited.

J. E. Plunket Machine Go-Briege 12, Ill.



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ECONOMY MACHINE PRODUCTS COMPANY

5207 Lawrence Ave.,

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SET SCREWS



The Standard of QUALITY

All standard sizes carried in stock for immediate delivery. Special cutters made to Blue Print.

As Cutter Specialists since 1919 we are able to offer the highest quality and service at attractive prices.

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Few Territories Open.

QUALITY TOOL WORKS Market St., Waukegan, Illinois

Use artificial or natural gas or gasoline. Start without generating"soldering heat in less than a minute." Schmidt "CONCEALED FLAME" Soldering Torches hold coppers steadily at any desired heat for continuous work. Very economical.

A moderate investment in Schmidt Equipment will step up production, reduce costs and increase profits. Send for circular.

MINN-KOTA FOUNDRY & MFG. CO.

Dept. 804

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for all Soldering Open Flame Werk Brazing Branding Laboratory Use, etc.

CONCEALED

FLAME TORCH

OPEN FLAME TORCH

AUTOMATIC STAKING MACHINE INCREASES PRODUCTION With Unskilled Manpower!



Outperforms conventional Riveters on numerous iobs.

A shortage of skilled workers won't upset your staking machine production if you use the Automatic Staking Machine which, even in unskilled hands, is fast, accurate and thoroughly dependable.

Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

Available in Three Sizes

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| 2" | 2" | 21/2" |
| 42/1 | 4207 | 11/4" |
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ONLY Complete **DUICK SHIPMENTS** ON AA-5 PRIORITY OR HIGHER

SAW-GUN

SAWS and FILES where no other tool can reach!

* Now, many hard-to-get-at sawing and filing jobs that formerly required hours of time and the use of several tools, can be quickly handled with one tool—the SAW-GUN.

Propelled by electricity, compressed air or flexible shaft, this new tool will rapidly saw or file light and heavy gauge metals of every description, corrugated or plain. It's ideal for panel notching in metal, wood, plastics and other materials. In fact, the Saw-Gun may be used advantageously in a wide variety of applications.

Sold on money-back guarantee.

See Your Jobber or Write Direct for Quick Delivery!

MID-STATES EQUIPM

2435 So. Michigan Ave. (SAW-GUN DIVISION) Chicago, III.

For marking plates, tags. parts, seals. discs, in metal, material, etc.



ACROMARK FOR PERFECT MARKING!

Easy to operate, the ACROMARKER offers faster, Easy to operate, the ACROMARKER citer's taster, more precise marking. Stamps nameplates up 5"35"%%" thick: die sizes are ½" to ½", and dies are replaceable. Automatie advance assures accurate character spacing. Operating lawer requires only a minimum of effort, and unskilled help can do perfect marking immediatoly. Writs for illustrated literature.

Make Fast Work of Small Jobs

Motor Driven

Timken roller or ball bearings to spindle

Write today for circulars.



Burke Machine Tool Co. 297 E. 16th St., Conneaut, Ohio

CONVERT ANY MOTOR

into a

Flexible Shaft Machine with an

ELLIOTT UNIT DRIVE



Investigate the advantages of the Elliott Unit Drive . . . write for Bulletin 44A giving complete information and prices.

MANUFACTURING COMPANY

STAR DUST speeds up pro-duction enormously and pro-duces finishes and super-finishes down to less than 1000004 of an inch.

Precision LAPPING

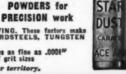
LABORATORY GRADED

or GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make TAR DUST indispensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

- Absolute control of particle sizes
 Complete absence of out-size particles
 Complete absence of out-size particles
 Complete range of grit sizes

There is a STAR DUST Field Serviceman in your territory.







No. 2 To No. 6

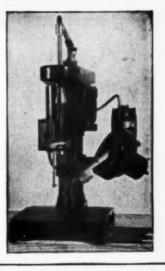
Screws Driven on this Husky but Sensitive Hopper Feed Screwdriver.

No handling of screws. Just place assembly on table, move from screw hole to screw hole. The machine does the rest.

Drives screws at one second each.

DETROIT POWER SCREWDRIVER CO.

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for SPEED and EFFICIENT USE UNIQUE HAND For 9-inch South Bend. Atlas, Clausing or Logan Lathes ATTACHMENT • Can Be Installed In 5 Minutes. • 6 Tool and Stop Positions. · Longitudinal Travel, 3-Inch. Sturdy Gear & Rack Movement. · Center-drill, Ream, Drill, Box-tool, Chamfer, Thread, Tap, Counter Bore, Etc. Ask Your Dealer or Write Direct To OTHER "UNIQUE" ATTACHMENTS, MANUFACTURING COMPANY FOR SMALL LATHEST OMAHA II NEBR.



or taste that substance. However, while our eyes may be perfect, while there may be plenty of objects around to be seen, if there is no light —our sense of sight is useless.

Good lighting is an absolute necessity for accident prevention. If the man who tripped on a tool in the dimly lighted aisle had seen it in time to avoid the hazard, lost production time due to his broken leg would not have occurred.

If glare had not temporarily blinded him, that pattern maker would not have lost those fingers.

If that heavy shadow over the press had been eliminated, that worker would still have his hand.

Industrial accidents can be reduced by the installation of good lighting. Hundreds of factories, large and small, have lighting systems wholly inadequate for safety. Inade-

for safety. Inadequacy may exist in new installations.
Good lighting must be engineered to prevent eye-fatigue, to eliminate glare, both direct and reflected, to minimize shadows and to provide see-ability for the prevention of accidents. There are a number of light sources and innumerable lighting fixtures which, properly engineered, can provide good lighting for any specific plant. It is essential that competent illuminating engineers should be consulted when changes in lighting are contemplated.

Providing good lighting on the basis of the initial installation is not enough. The lighting system must be maintained.

ACCIDENTS AND LIGHT

With about 87 per cent of our impressions being visual, there can be little doubt that the eyes hold the potential crux of accident prevention. In order to avoid any accident it is essential that the hazard be seen in sufficient time for proper action.

J. L. Kilpatrick, Westinghouse Illuminating Engineering Dept., emphasizes that seeing is the only one of our five senses which is dependent on some other factor. In other words, it merely requires the presence of a substance which will act as a stimulus to our other four senses in order that we may hear, touch, smell

CARBIDE



ORDER



ON STANDARD REAMERS—CENTERS
AND SCREW MACHINE REAMERS!

Accuracy and skilled workmanship are assured in Schmarje Carbide Tipped Tools . . . Try them and see.

FROM - SCHMARJE

TOOL AND ENGINEERING CO.

MUSCATINE, IOWA



GRINDING WHEEL DRESSER

5 MINUTE JOB IN SECONDS

The JIFFY is a time saver for accurate dressing of grinding wheels. It is easily attached to any surface grinder . . . becomes a part of the machine. Dresses absolutely true with a "twist of the wrist", in 5 seconds, whether wheel is near chuck or way above it . . . and without disturbance to set-up. Well finished, hardened and ground (ex-

cept bracket) . . . a money saver in any plant. Write for Bulletin 602 W.

Manufactured by FLORIAN MFG. CO.

Piantsville, Conn.



AMERICAN STANDARD CO.



"Just a twist



MCGILL MANUFACTURING CO., INC.

VALPARAISO, INDIANA

MOTOR BALANCING

Electrical and mechanical robots that probe into the causes of vibration in electrical motors and equipment to prevent them from shaking to pieces were described recently by Frank C. Rushing, Westinghouse Research Laboratories Engineer. He said that without a means of checking balance in the rotors, (the revolving parts of electric motors and generators) these machines would vibrate so violently that they would soon be wrecked.

He pointed out that the high speed machines, spinning from 10,000 to 60,000 rpm, precision built, recision tolerMcGILL Roller
with Bronze somet modern in needs. En are increasingly intire of their e-free perform-

The principles behind today's knowledge of these problems were developed to meet the vibration and balance phases of high speed machinery and of power generating units whose rotors and rotating parts must be kept within close tolerances of vibration.

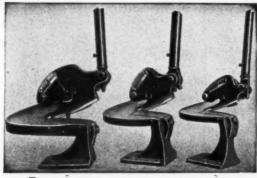
"It isn't too difficult to imagine the catastrophe that would result, in age alone, if a giant rotor, weighing 100 tons or more, would vibrate and tear the generator from its foundations in a power house," the speaker said.

Westinghouse developed the Dyne tric Balancing Machine, of which Mr. Rushing is co-inventor, to check motors and generators. This device is so sensitive that it can detect that it can detect as minute as a drop

of water.
"Electric networks, magnetic lines and flashing lights from a Stroboglow lamp provide the brain in the balancing robot to banish the threat of such vibration," the engineer explained. "The magnets and electric circuits pick up vibrations as slight as one hundred thousandth of an

slight as one hundred-thousandth of an inch, and translate them into electric currents.

"Relayed to the amplifier, these vibration messages are then analyzed, and the 'brain' calculates where the rotor is unbalanced and prescribes the amount of weight required to restore its balance.



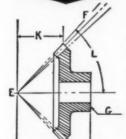
Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16* mild steel and 10 ga., stainless.

THE BEVERLY SHEAR MFG. CO., 3005 W. 110th Pl., Chicago 43, Ill.

Here's the Problem



... and here's the Answer _ EASY BEVEL GEAR GAUGING

No Long Calculations No Involved Set-up

With Herkimer sine bars and bevel-gear gauges, anyone with ordinary gauging experience and ability to read blueprints can quickly and accurately check all important bevel gear dimensions and relations. Production gauging made easy.

Write for Free Copy of Bulletin 100



HERKIMER TOOL & MODEL WORKS, 108 King St., Herkimer, N.Y.



This new, streamlined bench type grinder assures fast, quality finishing on metals, plastics, wood, fibre . . . at low cost. Built to machine tool specifications, Standard D-4 is equipped with improved band tension control and specially designed protective motor hood. 4x36¼" band. The ideal portable unit.

OTHER STYLES AND SIZES IN NEW MANUAL ON FINISHING—WRITE TODAY

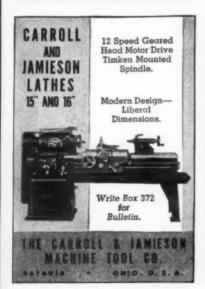
WALLS SALES CORP. 96 Warren St., New York, N. Y.

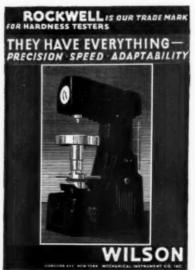


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(for precision work)
with the stylus that stays cool

R. B. ANNIS CO.







Write for Folder

J. W. DEARBORN

ANSONIA. CONN., U. S. A.





AVIATION TYPE Wherever perfect-func-tioning joints are re-

DIX Universal Joints come in 15 standard sizes, from %" to 4" Hub Diameter made to Army, Navy, Air Corps spec. AN-40236 ready to install, or can be made to customer's specifications. Eliminate "rejects" with DIX Universal Joints! Write, wire for catalog, prices, specifications, etc.

TERRITORY DISTRIBUTORS **JOBBERS** STILL OPEN

quired - Dix Precision-Made Universal Joints will give the utmost performance and satisfaction. Let Dix engineers help solve your problems.

PRECISION-MADE and

MANUFACTURING COMPANY 3447 FAST PICO BLVD. LOS ANGELES 23, CALIF.

MADE PRODUCTS

PRECISION

LOWN SLIP ROLL FORMING MACHINES



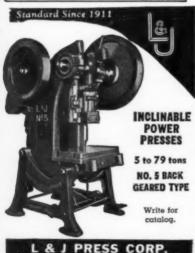
A sturdy, heavy-duty former with rolls of tough steel, turned and polished. Supplied complete with motor and drum type reversing switch. Sizes range from 38" to 98" roll length. All three rolls may be power driven if desired. Heavier and lighter machines also available. Write for details.

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"Dealers in Principal Industrial Cities"





successors to Loshbouch-Jordan Tool & Machine Co.



Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact easy to use—dependable.

Send for details - 5-day FREE TRIAL OFFER!

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ELKHART INDIANA

Will Not Mar Metal or Plated Finishes —

PYRALIN TIPPED MALLETS

The SOUTHWEST MALLETS—a necessity in every tool chest.

SEND \$1.00 FOR POSTPAID SAM-PLE MALLET.

Place your orders now for immediate delivery.



The only Pyralin Mallet on the market with threaded tips replaceable by hand. Plastic tips are quickly and easily screwed into the solid "non-sparking, non-magnetic alloy heads" when replacements become necessary.

Send For Your Free Desk Calendar Today. Limited Quantity.

SOUTHWEST MFG. CO.

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SANTA ANA, CALIF.



10 Days Will Prove the Value of PADDOCK BALL-BEARING BAND SAW GUIDES

If you're not satisfied PADDOCK GUIDES are the best on the market, you owe us nothing. Ball-Bearing Wheels running with the blade give the right kind of smooth-sailing support. Less friction—less wear—reduces blade breakage enables old or new equipment to cut more material and get more work done. Order today for FREE TRIAL—or write for circular and prices.

PADDOCK TOOL COMPANY

Guide Makers Since 1920
1418 Walnut Street Kansas City 6, Missouri

Paddock
BALL-BEARING
BAND SAW GUIDES

Guided and Guarded by 6 Safety Points





tion is much like that resulting from the introduction of high-speed steel when the machine tools had been designed to use carbon tools at much slower speeds.

As told in "Cuttings" published by Midwest Tool & Mfg. Co., Detroit this is brought to mind by a recent visit to a shop where comparatively new milling machines were having serious bearing trouble when speeded up to use carbide cutters.

Altho the speeds being used were nowhere near the maximum obtained with the cutters on newer and heavier machines, the time saved by the higher milling speeds was largely offset by the cost of production and down time of the machine.

One reason for the failure to obtain better results was running the cutters after they had become too dull for efficient work.

CARBIDE CUTTERS

Outstanding increases in production are being obtained in the machining of most metals by the use of carbide cutters when the necessary requirements and conditions are understood. Cutting speeds far in excess of those obtainable with high-speed steel are possible when the work is stiff enough to stand the impacts and pressure of the cutter, when the fixtures are sufficiently rigid and when bearings and feeding mechanism of the machine are good enough to handle the increased speed and pressure. The situa-

This was done to avoid stopping the machine to change cutters before the end of a shift, and because the work produced still had a satisfactory finish. It is partly because negative rake cutters continue to leave a good surface after they are no longer efficient, that they are too often run beyond the economical limit.

Dull cutters impose unnecessary stresses on the machine and also make it necessary to remove too much carbide when the cutters are ground. It then takes much too long to grind the cutter and

wastes carbide.

SEND US YOUR PRINTS FOR Outlations

THREAD GRINDING

Also Internal, External and surface arinding.

BROACHING SCREW MACHINE PRODUCTS MAGNETIC INSPECTION

GEARS

SPUR REVEL

WORM HELICAL



SPEED U

your tedious hand filing of dies with this



POSTEL DIE FILING MACHINE

Complete (without motor) \$38.00 F.O.B. Minneapolis

POSTEL MANUFACTURING CO. 244 - 17th Ave. No.

Minneapolis 11,

Minnesota

A TIME SAVER

YOU CAN EFFECT A SAVING OF 30 MIN-UTES TO SEVERAL HOURS on each job your machinists rig up on the Drill Press, Miller, etc. It does this by eliminating the necessity of hunting for Bolts, Clamps, Angle Plates, Parallel Strips, etc., customcrily used for holding the work. The JACKSON TIME-SAVING VISE effects this by means of its revolving Turret Jaw and Supplementary Jaws which enable it to hold almost instantly the thousand and one shapes that arise in manufacturing and repair work. No other vise is like the Jackson in design or accomplishment and the economies it effects will return its first cost to you in a few weeks of steady work.









Send for Bulletin No. 23-B Describing the JACKSON TIME-SAVING VISE

BROWN ENGINEERING CO.

126 N. THIRD ST. READING, PA.

DESIGNED FOR STEADY FAST OUTPUT

Ease of operation makes the Peer P-20 Automatic Welder a favorite with essential industries everywhere. Efficient operators are quickly developed, output increased with a more uniform product and less worker fatigue. Further advantages that have been demonstrated in plants of prominent manufacturers are reliability, decreased spoilage, and fewer delays.

Easily Controlled High Welding Capacity

Big cost savings are possible with P-20 high-production welders because of welding capacity and increased production speed. Peer Welders feature easy control of pressure, weld time, hold time, off time, current and speed. Throat depths of 12", 18", 24" are available.

Orders are filled promptly and present prices are still reasonably low. For illustrated Catalog 43, write today.

Pier Equipment Mfg. Co. 1552 Milton Street

1552 Milton Street Benton Harbor, Michigan



P-20 WELDERS

ANGULAR WORK

So much efficient equipment has been designed and built to aid in various types of angular work that this phase of metal-working has been greatly simplified as compared with the old days. Consider angle vises as one simple case in point. These are used, not only in the tool room, but on the bench and on the production line for many purposes, providing quick and accurate setups at any angle. Drilling, milling, marking, fitting, grinding and filing operations are all performed at various angles with dispatch, using vises of this kind to support the

work at just the required angles.

With workholding vises showing such advantages, and speeding angular work so greatly, it was natural that efforts should be made toward producing magnetic chucks that would offer similar advantages. This has been accomplished. At least one manu-facturer of magnetic chucks provides some which can be set at compound angles. One model is provided with a 360 - degree swivel base.

A good sine angle plate is the best an swer to problems involving the holding of work that cannot be held in a vise, or on a magnetic chuck, at the proper angle.

One of these has the tilting plate, on which the work is mounted, milled with T-slots, one across the length and the other

across the width, in such manner that they intersect in the center.

There are pins protruding from one edge of the plate, on an integral wing provided to accommodate them, which swing up or down with the table as it is tilted. Exact angles are determined by measuring over these pins, and over a block which is mounted rigidly to the base, using a 2" micrometer for the purpose. The arrangement is such that exact angles can be measured in any part of the quadrant.

It is a tough job to machine angles on large cumbersome castings.



Labor Time

Eliminate heavy lifting. Cut handling Table costs.

swivels and locks in any position. Can be varied 151/2" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO. 112 Webster St. Dayton, Ohio



LITTELL Air-Blast Valve automatically ejects LITTELL Air-Blast Vaive automatically ejects pieces from punch presses. Keeps operator's hand out of danger zone. Increases safety and speed. Air nozzle quickly adjustable.

Other Littell safety devices include Pres-Vac Safety Feeders for picking up and Feeding flatsurfaced materials; also, air-operated Mechanical

Pickers for feeding pieces that vacuum lift will

Littell makes a complete line of Automatic Reels, Feeds, Straighteners, REQUEST Scrap Cutters, etc.

4153 Ravenswood Ave., Chicago 13, III



The Model JA is new in design both inside and outside. In it are utilised fewer parts, and they are made of Magnesium and Aluminum for extreme featherweight lightness. The alloy steel shaft diameter is unusur ally large for sustained smooth and true operation. This means still longer wheel life and better grinding. The speed, as before, is governed at 50,000 R.P.M. and there are selected DULU R.F.M. and there are selected ball bearings, front and rear. The JA Featherweight is a distinct im-provement over all models previously produced by Madiaon-Kipp, the orig-inators of really high speed grinders. ORDER TODAY!

THE SAME LOW PRICE!

Weight 12 Ounces; Length 6¾ In; Chuck Size ½ In. Wheel Guard Removed for Better Illustration.

MADISON-KIPP CORPORATION 257 WAUBESA ST., MADISON 4, WIS., U. S. A.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

| Vise No. | Width of Jaw, Inches | Opens Inches | Weight |
|----------|-------------------------|-----------------|--------|
| 1D 2D | 31/2 | 31/2 51/2 | 121/2 |

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA





Old drills with their twisted or broken tangs are made like new with NU-TANGS. They eliminate the necessity of welding and use of inaccurate sleeves. Reconditioning your drills with NU-TANGS is simple and easy. Do it right in your own shop. Complete instruc-

tions are included with every shipment. Just specify shank sizes. NU-TANGS are made to fit any Morse taper shank, \$2, 3, 4, 5 or 6. NU-TANGS make every old drill a new drill.

Write for prices and simple instructions,

METZ AND SCHULTHEISS COMPANY

382

HART'S Machine Vise Jaws



These Jaws are useful on any machine table. The angle holding the work down. Suitable to clamp or bolt to table. The hardened tool steel jaw measures $3"\times6"$ 1/2" thick angle edge serrated.

HART'S Milling Fixtures



These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—to hold stock from ½ to 5 inches.

HART MACHINE CO.

26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

For AIRCRAFT and MUNITIONS



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PRECISION WORK IN MANUFACTURING

65 Standard Styles and Sizes. Manually operated presses $\frac{1}{4}$ to 35 tons pressure. Motor driven hydraulic presses $\frac{1}{2}$ to 30 tons pressure.

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GREENERD ARBOR PRESSES

NASHUA

Est. 1883

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ELECTROAIRE POWER Is Cutting Spoilage and Tool Breakage Almost in Half

IF you drill, ream, or tap small holes the Bellows Electronire Power Feed will help you obtain more production, with less tool breakage, and fewer work rejects.

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scientist's war." sav Messrs. Pendray and MacLean. impetus to research and industrial development has been even more pronounced than in World War I. Research departments have packed approximately 15 years of development work into the three vears the U.S. has been at war.

1 1

S

"Postwar applications of these developments are almost limitless, and will provide opportunities for welltrained science students in every field," they con-tinue. "It is the duty of the science teacher to keep abreast of these developments so as to retain the vitality of his teaching. It is the obliga-tion of industry to do everything possible to assist him "

It is no wonder that this warpaced progress in industry threat-

ens to outdistance the high school and college science instructor, the article points out, and he is not to blame for that condition. Often handicapped by his specialized background and by textbooks too out of date to interest the pupil of today, the teacher faces difficulties. Radar, penicillin, the automatic pilot and plastics fill the mind of the modern youth, and he wants to know more about them. But the instructor, perhaps, got his scientific training years before such things were ever developed.

Yet industrial research has to have

youth.

The Bellows co.

AKRON 10, OHIO

SCIENCE EDUCATION

Industry and the schools must cooperate in order to bring about suitable scientific education in the postwar field, an article appearing in the magazine "Education" declares.

Under the stimulation of war, the research scientist has stepped ahead of teachers and textbooks, G. Edward Pendray, Assistant to the President, Westinghouse Electric & Mfg. Co., and Charles W. MacLean, Assistant Director of Education for that Company, assert in a coauthored article.
"World War II truly has been called a

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1 1

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OIL PURIFICATION

Purification of lubricating, hydraulic, cutting and honing oils is a matter of much greater importance in some plants than others, but it is not unimportant in any plant of appreciable size. Good filters for lubricating oils definitely reduce lubricating costs on one side of the picture, improve precision products and extend the life of machinery on the other. Some firms furnish filters for lubricating oils, which work either with or without a definite oiling system, and in sizes from five gallons per day upward.

There are some filter manufacturers

who are so extensively engaged in the filter business that they furnish units for filtering food products, lacquers and many other products, as well as for oils. A company of this kind can provide filters adapted for use with coolants, fuel oils, lubricating oils, hydraulic oils, or what have you.

One line of filters of this kind is designed to couple directly into an oil line, providing a full and continu-ous flow of clean oil. An outstanding feature of these filters is that they have an all-metal, non - collapsible cartridge that can be cleaned while it is in operation, merely by turning a handle. This handle can be turned manually, or provision can be made for periodic and automatic turning.

One line of oil purification equipment has been observed, which incorporates an automatic clarifier

for removal of abrasives and foreign particles from oil. This unit handles from 15 to 100 gallons of oil per minute, and is particularly suited for cleaning grinding and honing oils in volume. It will, however, remove sediment and microscopic particles from any liquid. The same line of equipment includes other units, for handling special problems of oil contamination.

One type of strainer which appears to be especially adaptable for removal of particles of metal from coolant, before they can enter coolant pumps, is constructed of knitted and crimped mesh.

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40% higher than the corresponding period in 1943.

The low in applications for about 30 years came in 1943, when 45,535 were received. Last year the number rose to 54,232, and now is running at the rate of about 62,000 a year.

"The rise in patent applications shows that American inventors are confident that patent protection will be continued," said Mr. Dearborn. "The fundamentals of the patent system should be preserved, as patents mean jobs. The incentive to invent must not be curbed if maximum employment is to be provided in the important post-war period."

Another indication of the tremendous interest in postwar business is the fact that the Patent Office is being deluged with requests for print-

Office is being deluged with requests for printed copies of patents already issued.

While applications for patents are increasing rapidly, it was pointed out that it will be some time before there will be a gain in the number of patents granted because, due to war conditions, the Patent Office staff is not large enough to cope with the increase in work. Issuance of patents in 1944 totaled 28,073, the lowest since 1902, and 45% below the peak reached in 1932. The slump has been attributed partly to the depression, partly to court decisions unfavorable to patent holders and partly to the war.

PATENTS

A marked increase in the number of applications for patents now being filed in the Patent Office indicates that American inventors have faith in the future of the United States and are endeavoring to create many new products for the postwar era, R. J. Dearborn, Chairman of the Patents Committee of the National Assn. of Manufacturers, declared recently.

Patent Office statistics show that applications for patents for the first four months of 1945 were about 20% above the similar period of last year, and nearly

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WIRE OPERATIONS

Since wire is coiled in nearly all cases, equipment designed for handling any type of coils can be used to advantage for handling wire, as a rule. Recently there was observed a special type of crane truck, having the crane fitted with a peculiar kind of hook, which could be run thru a number of coils of wire, (often a half-dozen or more), to handle them from one place to another. The same crane truck can be fitted with other handling devices to replace the hook, when other types of materials are to be handled. Similar hooks for handling

wire coils have been developed by one of the manufacturers of monorail systems. These, however, are supported from dual hoists, used in connection with monorail tractors, and are known as hairpin hooks.

The manufacturer providing these claims that about 40% of all the wire coils produced in this country are handled on such hairpin hooks, Up to 11 bundles or coils weighing 300 pounds each, can be picked up and delivered by a monorail tractor cab operator, using such a layout, without assistance from any floor man.

The same company making these hairpin hooks also provides internal and external block - stripping wire grabs, by means of which coils of rod and wire are easily stripped from blocks in the

wire mill, in conjunction with the monorail system.

Special wire coil handling hooks can also be applied to the overhead types of chain conveyors, and there are many such applications. Such a handling method is of particular value in carrying coils of wire thru an annealing furnace. Since the speed of such a conveyor system can be closely governed, the length of time required for coils of wire to pass thru a furnace of given length can be closely controlled. Thus, the degree of annealing can be governed properly.

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Parts which cannot be held by chuck or collet—oddshaped parts such as oil can bodies, spun shapes and flat stampings—are now readily handled by the new Crozier Vacuum-grip Polishing Lathe.

The lathe generates its own vacuum, without piping or glands. It starts, holds the work (copper, brass, aluminum, zinc, magnesium, plastic as well as steel), stops instantly, releases the work automatically for low cost production. All work is held firmly for polishing and burnishing and many other operations.

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Model 1VPL Crozier Vacuum-grip Polishing Lathe, has a 1*-8 thread spindle. Furnished with an 1800 or 3600 r.p.m. 220-440 or 550 volt 3-phase 50 or 60 cycle motor, the price is \$290 f.o.b. factory.

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DUPLICATION OF DIES

In metal-working plants having standard lines of work, produced in large volume, there is always the proposition of duplicating dies as they wear out or break. In places where there is much of this duplication, it pays to have some sort of duplicating equipment. Then it is unnecessary to start the jobs from scratch each time. One can have masters on hand, and work from them each time new dies are required. Three-dimensional copying machines may be had from engraving machine manufacturers, and these are very useful on a great variety of die duplication work. One machine of

this kind in particular has been widely applied on duplication of plastic molds and dies, etc.

A company that has long made a line of standard die duplicators, which reproduce direct from an original in 1 to 1 ratio, neither enlarging nor reducing, later developed a line of pantograph machines which reproduce dies in reduced ratio.

This line of machines makes it possible to reproduce dies in almost any desired size, from one model. Models may be made of stone composition, hardwood, bakelite or other materials, as well as using an actual die for a pattern. Reproduction ratios rang from ½ to ¾th size of the model used.

One company which makes a combination vertical milling machine and jig borer, has developed a profiling attachment for use in

ment for use in connection with it, by means of which a rather wide range of die and mold work can be duplicated. Contour milling may be done with this equipment, using models of wood, plastic or plaster. The arrangement is such that the contour milling attachment can readily be engaged or disengaged from the machine.

Those acquainted with hydraulic follower attachments, as they are applied to metal working planers and shapers, as well as to standard mills and lathes, will realize, upon due consideration of the matter, that such devices have wide application in duplicating certain types of dies, molds, etc.

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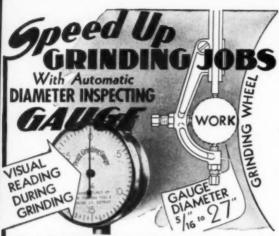
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NYLON PAINT BRUSHES

Nylon, widely acclaimed for its superiority in fabric uses, is also now recognized as a material of special importance to America's paint brush industry. At its advent in 1941, brush makers declared it the most significant advance of the last 25 years of their craft. They now agree that the new nylon tapered bristle-developed for war use offers exceptional possibilities for better post-war paint brushes.

More than a million and a half paint brushes bristled with nylon filaments have been supplied to the Navy. Produc-

tion facilities developed to provide the huge quantities required by the armed services assure a domestic source of bristle that is expected to open up new fields in the post-war market for topquality paint brushes

For 25 years before Pearl Harbor, the production of synthetic tapered brush material with the resilience and toughness of na-tural hog bristle had been a goal of research. War made the achievement of that goal an immediate necessity, for substantially all bristles had been imported from the Orient.

Faced by an acute shortage of bristle, the armed forces turned to Du Pont. The company already was in the final stages of perfecting a process for the manufacture of a tapered nylon bristle. This project was com-

pleted in time to avert the threat of a bristle shortage for brushes which would have been a serious handicap to the war program.

Nylon bristles had the requisite taper, resilience, toughness, length, and inertness to paint and cleaner ingredients. In painting a great variety of surfaces, it was proved that nylon brushes wore at least three times longer than hog bristle brushes.

The war service record of nylon bristles is outstanding. The American paint brush industry in a normal year uses up to 21/2 million pounds of bristle.





BAKER

Here is a Model 150 Universal quick change type heavy duty drill tooled up with a fixed center, multiple head and work holding fixture emphasizing flexibility of this type of machine for general purpose operations as well as high production.

This set-up is for multiple drilling of 12 holes 35/64'' diameter on a $2\frac{1}{16}i''$ bolt circle on distributor drive gear for aviation motors.

Machine is equipped with a Baker flange quill spindle construction for better mounting of multiple head. This mounting gives added rigidity to the mounting of the multiple head from the main machine spindle bearing and allows for use of the maximum spindle travel of the machine. This set-up emphasizes Baker service of completely tooling both geared feed heavy duty drills as well as the Baker line of hydraulic feed machines.

Let us send bulletin describing this versatile machine.

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Interchangeable type Allen Template Transfer Punches are made in diameters from .040" to .375". Heavy duty and solid types, from ½" to %". Special sizes and types on order. One aircraft plant alone has purchased more than 150.000 of these punches, Write today.



DIE HANDLING METHODS

Handling dies into and out of presses is highly laborious in many shops that have not given proper attention to the problem. There is adequate equipment in use in other places, however. A handpower lifter observed recently, was especially built for a press shop handling small die sets in and out of presses. The unit is on casters, like a truck, to make it readily portable; it is really a portable elevator having a platform 24" square. It can be lowered to a point 6" above the floor, and has a lift of 42" from that point. Tho primarily meant for handling die sets, it is sufficiently versatile to do

a great deal of other work, also.

One special die truck has been observed, which has a table vertically adjustable, to permit dies and other heavy parts to be transferred without effort, from table to press or machine, and vice versa.

This equipment is more versatile than many pieces of die handling apparatus, for it has a built-in hoist, designed for separating and assembling heavy leader pin die sets. Dies weighing 1,000 pounds and more can be separated readily by one man, using this hoist. The unit is mounted on heavy ball bearing casters.

While many pieces of die handling equipment are fitted with elevating tables having single elevating rams under the centers, one has been observed which has the ta-

ble supported and elevated at all four corners, by four elevating screws. These screws are all fitted with sprockets, and are connected with an encircling roller chain, so that operating one of them automatically operates all of the others. Operation is by means of a hand crank at either side, and all four of the screws are mounted on ball thrust collars. An interesting feature is that a special socket can be supplied, applicable to an electric drill, so the table of this die handling ruck can be raised or lowered by the power of such a drill, instead of using a hand crank. Some portable elevators provide special die-storage racks.

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Facilities for proper handling of metal
parts thru different phases of heat treating are always of interest. Most manufacturers of monorail systems have developed auxiliary equipment used in such
work.

One layout observed comprises a simple loop of monorail, on which is mounted an electric hoist and a special grab, which allows annealing pots to be picked up, and dumped while they are suspended over a shakeout. It is claimed that this simple system cuts handling costs some 64% in the plant where it

is installed.

Another layout designed to work in conjunction with a quenching operation consists of a hoist and a monorail crane, which serves four or more furnaces, arranged in pairs. The monorail crane is of bridge type. Mounted on it is a special swiveling truck, which rides on runways on the crane

A hoist works in conjunction with the truck, to raise one end of a fulcrummed, counterweighted arm. One end of this arm is designed to reach into the furnace and engage the annealing pot, while the other end carries the 900-pound counterweight.

With such an arrangement, counterweighted end of the arm is raised by the hoist, to allow the opposite end to engage the annealing pot. Then, when the counterweight is allowed to descend, it produces a reactive motion in

the arm which lifts the pot clear, allowing it to be removed from the furnace as the crane is drawn back. The arm is then swung in an arc, to deposit the pot in the quenching machine.

Special baskets are used frequently for handling small parts thru heat treating processes. Such baskets are made chiefly of wire. They are produced by different companies; one firm in particular furnishes open-mesh baskets for both annealing and quenching.

Open-mesh conveyor belts are also furnished by some firms for use in different kinds of heat-treating operations.



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JACKS

The various ways in which a jack, or the principle of a jack, is used thruout industry is always of interest. Of more particular interest in the metal-working industries than nearly any other type of jack, is the kind used in leveling up and aligning work, on the tables of planers and other machine tools.

A set of planer jacks kept at hand will greatly decrease the amount of time required for setting up a given job. Because they are left in place to support the workpiece, while it is being machined, they provide, in addition to their ready

adjustability, a degree of solidity in the setup otherwise difficult to obtain. Both vertical jacks and so-called bracing jacks are used in such work. Planer jacks of both types are used in various

The degree to which some companies have developed jacks to make them versatile is indeed remarkable. Such developments have meant much to many a maintenance crew, as well as to men engaged on certain types of production.

Originally the jack was strictly a lifting device. Now, some make them in such manner that they may be used for lifting. lowering, pushing or pulling. Some of these will handle loads in an angular position, from the floor, and are automatic lowering.

"Pulling may be possible with mechanical jacks, someone observes, "but powerful hydraulie jacks must

necessarily be of such design that they cannot be advantageously used for such duty." But wait a moment! Have you considered hydraulic jacks with relatively large holes passing thru the cen-ters of the pistons? Such a design is not only possible; it is an actuality. Hydraulic pulling jacks are actually available in such a type, in capacities of 20, 70 and 95 tons.

Jacks as made by some companies are used, not only for various tensioning and clamping duties, but have been found highly useful for wheel and gear pulling, a necessity in rebuilding machinery.



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COPPER APPLICATIONS

Most of us know that copper is highly versatile, but it is probable that many of us do not realize the extent of this versatility. The use of copper alloyed with other materials has expanded its borders immeasurably.

In addition to copper alloys used for specific purposes in their own right, it is highly useful in different alloyed forms for joinery. Welding rods of copper and copper alloys are very important, and are obtainable from some firms in a number of types, used for both gas and electric welding. One of these firms, in addition

to various other copper - alloyed welding rods, has one of low-melting Tobin bronze. Melting at 1625° F. it is ideal for many repair welding jobs.

Have you ever encountered copper where it is used as a pigment in a coating material? One such coating has been developed, in which minute flakes of copper are suspended in a vehicle.

When applied to concrete or steel, it produces a corrosion-resistant coating that will not crack, scale nor chip as the result of seasonal temperature changes. The copper flakes combine, and adhere to the surface, while the vehicle rises and forms a second protective film. As the copper is entirely covered, the coating is a non-conductor of electricity.

Insofar as the working of copper in its various forms is concerned, those who have had much to do with it know that it has its pe-

that it has its peculiarities. It is amenable to cutting off with abrasive cutoff wheels, the same as other metals, but there are certain types of cutoff wheels better adapted for copper. Wheel manufacturers can give specific recommendations.

A different type of cutoff wheel is used for cutting copper bars than is used for cutting copper tubing and small sections. Usually, the same kind of wheel is used for cutting copper bars either wet or dry. In the case of copper tubes and small sections, a different wheel is indicated for dry cutting than for wet cutting, in many cases.

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Spindle speeds with 1800 RPM motor

Feeds per revolution of spindle

9" Column

Bearing of arm en column Size of main driving motor Height of drill column over Working Surface of Base Net weight

| 3' Arm | 4' Arm | | 30 | Arm |
|------------------------------|----------------------|------|-----|---------|
| 731" | 96" | | 12 | 0" |
| 431" | 48" | | 4 | 8" |
| 101" | 10" | | 1 |)** |
| 94" No. 4 | No. 4 | | B. | 4" |
| 24" | 24" | | 2 | 122 |
| 214" | 243 | • | ** | <u></u> |
| (60, 85, 130 (425, 560, | 180, | on | all | models |
| (1200 RPM | | | -11 | modela |
| (85, 130, 18 (860, 860, 1 | 180, | on | WII | models |
| (.004" .007" (.010" .020# | | on i | ali | models |
| 14" | 18" | | 11 | 300 |
| 2 HP. | 2 HP. | 8 | 2 | HP. |
| 29"x45" 4000 ibs. | 38"x80" 6200 ibs. | 8 | 0" | 188" |
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Left - 100 Series

Left Hand-Reverse Image, Right Hand Shown

| rest mand-stead | erse amage, | might mand shown |
|-----------------|-------------|---|
| Tool No. RH | LH | Shank Size |
| R-100 | L-100 | 1/4 x 1/4 x 2 |
| R-101 | L-102 | 5/16x5/16x21/4 |
| R-103 | L-104 | 3/8 x 3/8 x 2 1/2 |
| R-105 | L-106 | 7/16x7/16x3 |
| R-107 | L-108 | $\frac{1}{2}$ x $\frac{1}{2}$ x $\frac{3}{2}$ |
| | | |



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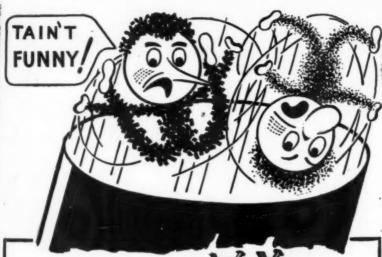
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